TOOLING & PRODUCTION Magazine

DECEMBER 1958

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Scrap reduction, greater strength, intricacy of shape, lowered fabricating costs, and faster production are also virtues of this new-old process.

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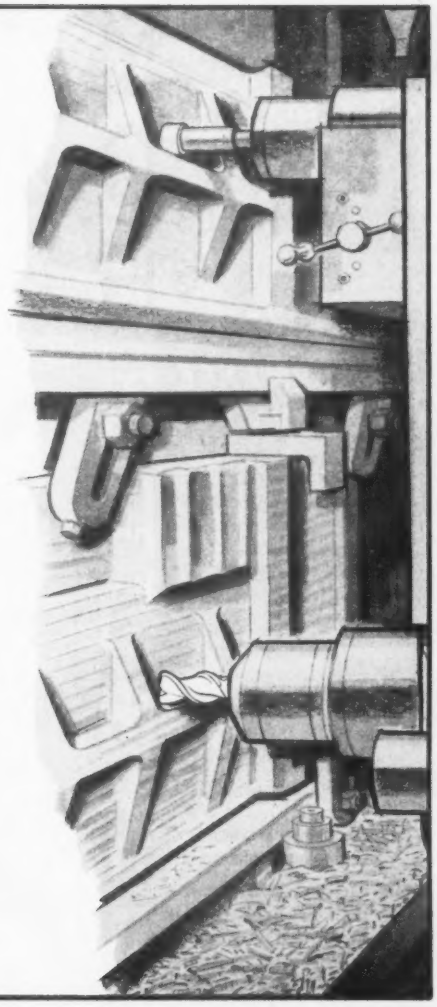

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TOOLING & PRODUCTION Magazine

DECEMBER 1958
VOL. XXIV No. 9
GEORGE J. HUEBNER, Founder

PERSONALLY SPEAKING

Dear T & P Reader:

The people have spoken in Ohio. In this letter in the October issue of T & P we reported that a Right-to-Work amendment was on the ballot through initiative petition. It was resoundingly rejected by the voters.

Little can be accomplished here through post mortems, but we believe that all people should reflect briefly on one point. In Ohio, previous to this election, there never has been an opportunity for the citizenry to express itself on this question in a public election.

Signers of the Right-to-Work initiative petition and backers of the program are to be commended for getting the issue on the ballot so that the people could choose.

And in Ohio as in most of the other states that had Right-to-Work on the ballot in this election, the people voted overwhelmingly against it. Members of unions and their families have given union officialdom a vote of confidence of enormous proportions. And incidentally, this result also means that union members and their families and friends strongly favor compulsory unionism.

It's well known, of course, that R. T. W. was not sponsored by union members. Perhaps in the future it should be wanted by those directly affected before it gets on ballot again. As long as they don't want it, it will never be passed, regardless of any merits it may possess for anyone.

Cordially yours,

Ray Huebner

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Editorial and Business Offices: 1975 Lee Road, Cleveland 18, Ohio, FAirmount 1-4040
Printing Office Address: P.O. Box 1494, Louisville, Ky. (For Plate Shipments Only)

Published Monthly by HUEBNER PUBLICATIONS, INC.

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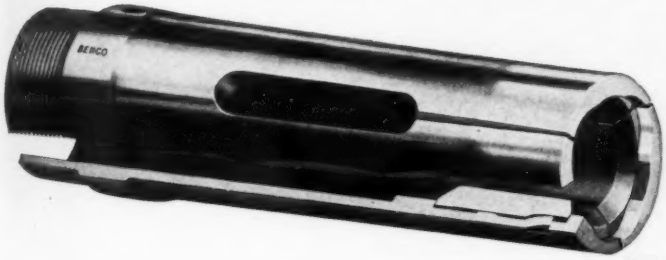

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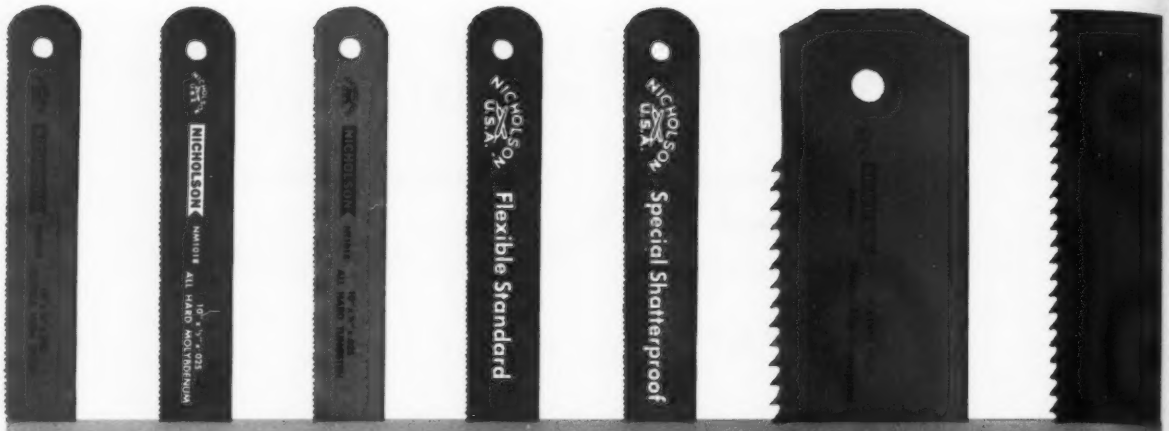

Best way to find out what these really do is try 'em

It's the old story of the pudding and the proof. You don't know how good these new Nicholson Hand and Power Hacksaw Blades, and Band Saw Blades and Black Diamond Hand Hacksaw Blades are till you've given them a try. Same goes for Nicholson *Precision* Ground Flat Stock.

Selected Industrial Distributors all over the country have these fine new products now. And while they're new products, they're made in the quality tradition of Nicholson and Black Diamond files.

There's a blade for your metal cutting jobs. Most likely you'll find that we offer advantages you haven't been getting in the blades you're accustomed to. As for the Flat Stock—well, you name it and your Nicholson Flat Stock distributor will see that you get it—even out-of-the-ordinary specifications.

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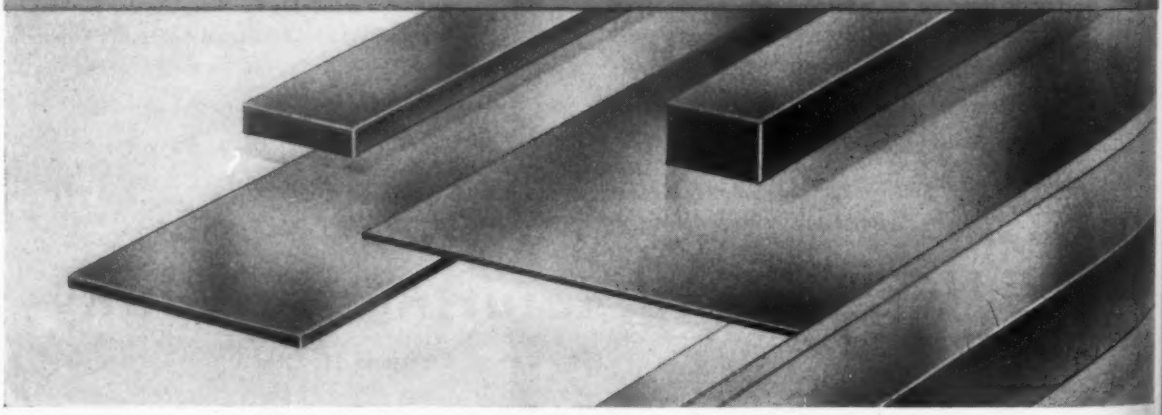

CIRCLE INFORM-A-GRAM KEY NO. 8

Talk of the Month

WHAT ABOUT FOREIGN COMPETITION?

by A. E. Drissner
Vice President
THE NATIONAL ACME COMPANY
Cleveland, Ohio

DURING THE FIRST AND SECOND WORLD WARS, I had the opportunity of working with several committees, such as the standards committee and the War Production Board. We found the tool engineer was a very important contributor in the production of war materials required at that time, because no machine produces efficiently if the tooling is not correct. Therefore, the tool engineer is the key to greater accuracy and higher production. The machine tool manufacturers have recognized the tool engineers far reaching demands and have been forced to change the design of their machines to meet these requirements, with more modern tools.

I remember the time when high speed steel was introduced — which was a step forward from the ordinary tool steel and toward the tungsten carbide tools used today — the machine tools had to be re-designed to take higher spindle speeds and greater feeds. This naturally required more power and greater rigidity. Therefore, you are no doubt acquainted with the new designs of machine tools, which have changed considerably in the last 50 years to meet these conditions. The present demand in machine tool design is simplicity, power, and accuracy.

To meet the foreign market, we were obliged to start the manufacture of our machines in Europe; in 1930 through The Pittler Co. in Germany, and in 1932 through the B.S.A. Co. in England, under license agreements. This has worked very successfully and has since been followed by a number of other American machine tool builders.

I wish to give you an idea of the competition we have to meet in the future. Before the war there were only 400 machine tool builders in all of Germany, but during the war occupied Germany, France, and Italy became educated in the building of new machines and tools for making the necessary equipment for the war. Today Germany is divided, and in Western Germany alone there are now 600 different machine tool builders, modernly equipped and doing exceedingly well. You will find this same expansion is true in Italy, France, and Holland. With their low labor rate and conscientious workers they can more than compete with our American products.

From what I hear there are a number of American manufacturers complaining bitterly about the import of foreign goods into the United States. We cannot expect to alter this condition with higher import rates, but with better and cheaper tooling. If we want to export to foreign countries, we must import from them. It always works both ways.

To meet these conditions, especially in the field of drill presses,

. . . Continued on page 11

Adapted from a talk presented at a recent meeting of the Cleveland Chapter, American Society of Tool Engineers.

Appliance manufacturer forms flat stock to scroll shape.

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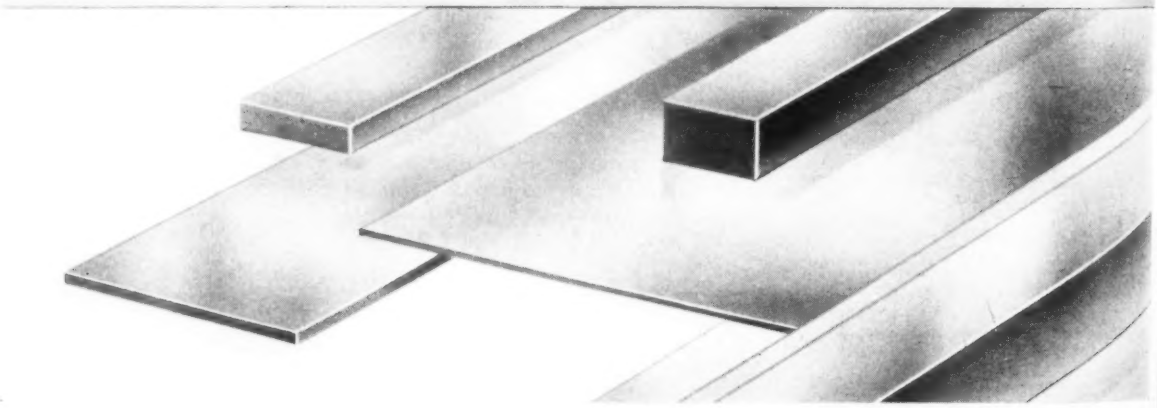

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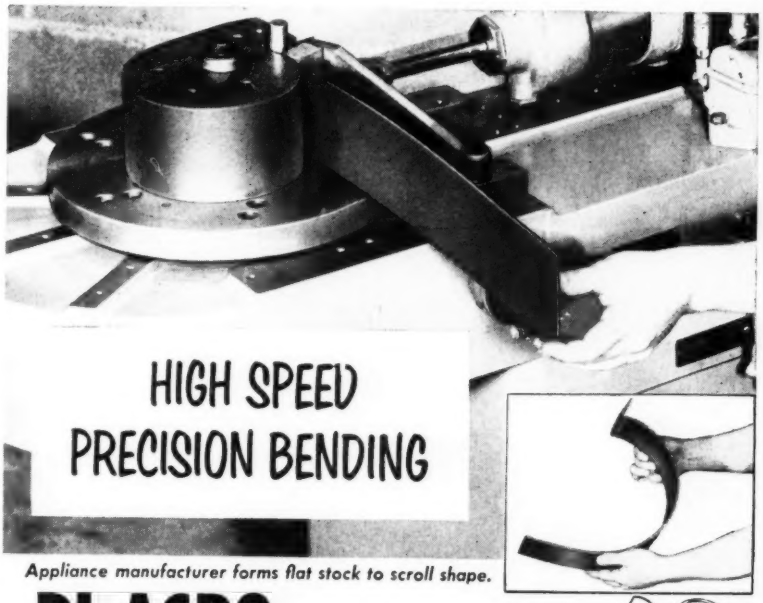

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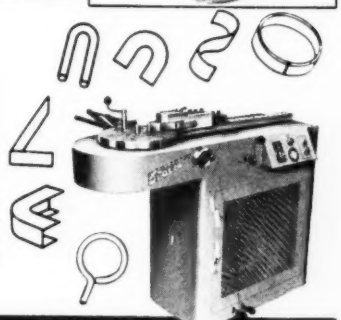

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CIRCLE INFORM-A-GRAM KEY NO. 10

. . . Month's Talk from page 9

milling machines, and lathes, which create the greatest competition, some American companies are manufacturing their products in Europe, where labor and material are cheaper. Then they import their own products to the United States, to be in line with competition. For example, The Cincinnati Milling Machine Co. is manufacturing their line of machines in Birmingham, England and Holland, with great success. The workmanship, if guided by our American methods, is just as good as on our American made machines.

The only country which in the future will be our biggest competitor is Russia. Their machines are not up to date and are mostly copies of European and American made machines, but they are built strong enough to take carbide tooling and the selling prices can be controlled by the Russian government to meet any competition, without any loss to them. In fact, they could give the machines away in exchange for some other raw material controlled by the capitalistic countries.

Another important feature in Europe is the fact that every young man has to decide what line of work he wants to follow and then must pass his apprenticeship under government control. For instance, in Germany the manufacturers are obliged, by law, to have 15% of their young employees go through apprenticeships. This way they have a good supply of young employees coming along in the various fields. Because of the war, about 10 years were lost in training young men for industry, but by this method they are now increasing their supply of trained personnel. These trainees are very conscientious workers.

Europe's Catching Up With Us

From what I have seen in the foreign exhibits, the European manufacturers and tool engineers are quickly catching up with us. They are producing large quantities of tools and machinery, and they are working hard to increase their exports.

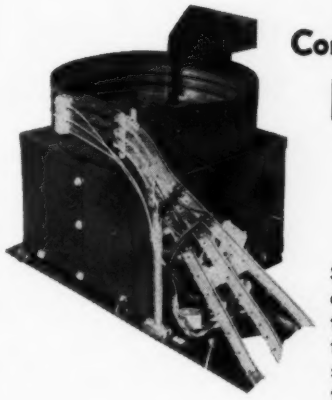
From other reports, I find there is going to be a free exchange of goods in the six major countries after the first of the year. If we want to export to these countries, we have to pay the duty on all imports for them.

Export and import to the satellite countries, Poland, Czechoslovakia, and Hungary are also going to be open to foreign markets, and, although we can export to them, we

. . . Continued on page 14

SYNTRON can supply

either



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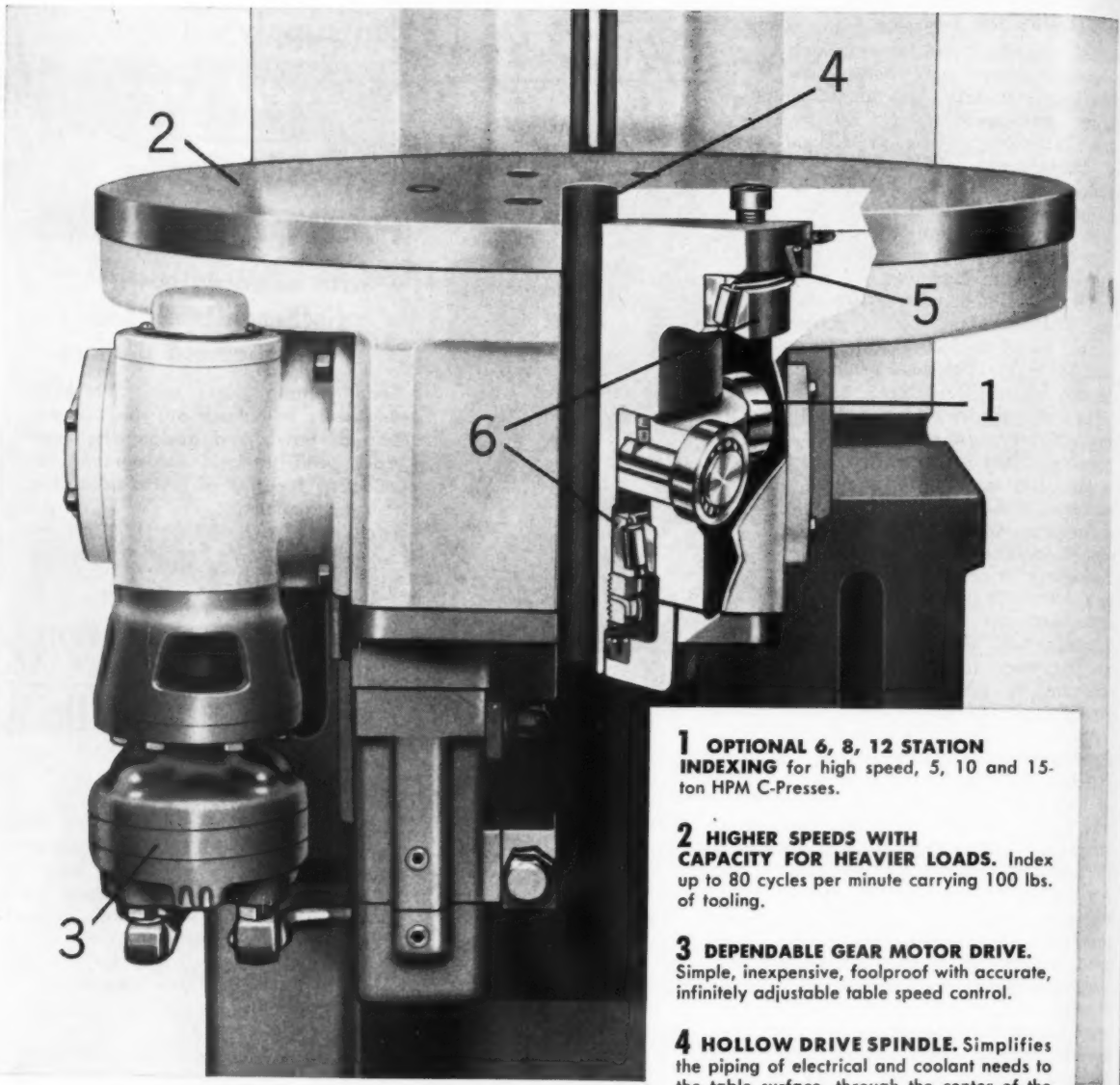

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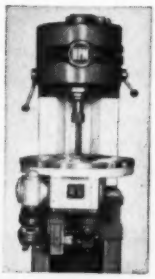
4 HOLLOW DRIVE SPINDLE. Simplifies the piping of electrical and coolant needs to the table surface, through the center of the table from underneath.

5 SEALED DRIVE UNIT. Index table drive unit is completely sealed from coolants or abrasives used on the table surface.

6 ANTI-FRICTION BEARINGS USED THROUGHOUT. Smooth, long-lasting trouble-free service is assured.



7 ACCURACY. Each index of the table locks in work position with an accuracy of .002".

8 SIMPLIFIED MAINTENANCE. COMPLETELY J.I.C. Standard foot-mounted motors, exposed pump, hydraulic motor and valving are easily accessible.

Eight production advantages standard at no extra cost

Here it is . . . the new H-P-M index table press combination, for production men charged with getting more return for their invested dollar. It's fast, accurate and completely J.I.C. with many other worthwhile production advantages. Check the outstanding features at the right . . . our offering for the best buy on the market.

Write for new catalog, today. Plan for more profits by planning with H-P-Ms.

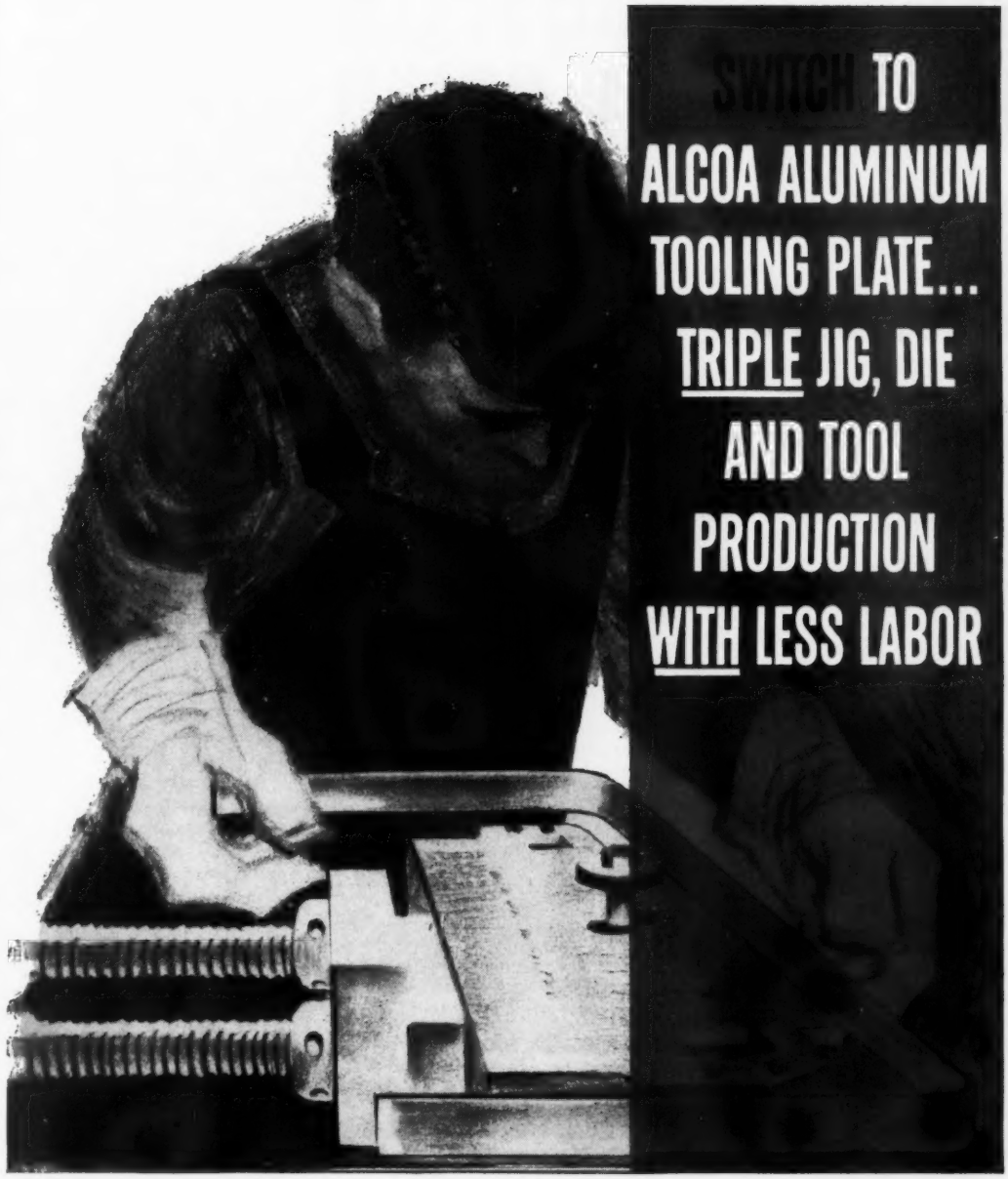
THE HYDRAULIC PRESS MFG. COMPANY

A Division of Koehring Co.
Mount Gilead, Ohio, U.S.A.

HPM

H902

CIRCLE INFORM-A-GRAM KEY NO. 12



That's a mighty big order for any shop, but Alcoa® Aluminum Tooling Plate and Alcoa Tool and Jig Plate can fill it. Here's a case in point. You can make three times as many core blower plates from 100 pounds of Alcoa Tool and Jig Plate as compared to the number obtainable from 100 pounds of conventional tooling plate. Now add these other savings: aluminum machines three times faster with better accuracy . . . machines and tools last longer . . . less maintenance is required.

Slash Labor Costs as Much as 60 Per Cent. Along with aluminum's high-speed machining characteristics, you get all-important light weight for savings in handling. Because it weighs but one-third as much as iron or steel, changeovers are reduced to a one-man job. An aluminum jig takes less time and work to open, close, move, store or set up.

Call Your Local Alcoa Distributor. Order locally from a wide selection of sizes and gages, cast or rolled. Alcoa Tool and Jig Plate is ideal for high-precision tooling needs. Alcoa 6061-T6 Tooling Plate is a wrought aluminum plate for high-strength utility requirements.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

Aluminum Company of America
1992-m Alcoa Building, Pittsburg 19, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 13

FREE BROCHURE TELLS HOW YOU CAN GRIND PRECISION HIGH PRODUCTION DIES

IMPORTANT TO YOU!

Free booklet tells how VISUAL GRIND facilitates construction of precision high-production dies, dies for powder metallurgy, lamination dies and special purpose dies. VISUAL GRIND permits through, blind and templet grinding . . . permits continuous inspection by magnifying work from 10:1 to 100:1 . . . upgrades semi-skilled labor . . . permits easy maintenance of dies in your own plant . . . reduces costly down time. VISUAL GRIND COMPLETES YOUR TOOL ROOM.

Visual Grind solves the problem in mind

Intricate grinding jobs like those shown above ordinarily involve several machines. ALL WERE FORM GROUND ON A SINGLE VISUAL GRIND.

CLIP and MAIL THIS COUPON TODAY

The CLEVELAND GRINDING MACHINE Co.

1730 EDDY ROAD CLEVELAND 12, OHIO

Please send me the free brochure describing the capabilities of the VISUAL GRIND.

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Company .....

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City ..... State .....

CIRCLE INFORM-A-GRAM KEY NO. 14

. . . Month's Talk from page 11

also have to meet the Russian export of modern machine tools to these countries. Therefore, competition will be keener in the future and the only way we can meet this condition is with more advanced, efficient tools.

From other reports the Russians have indicated that in the machine tool line they are now completely independent and can produce not only their own requirements, for peace and war production, but also those of China, under their 1953 agreement. This includes machine tools for manufacturing automobiles, trucks, agricultural machinery, tanks, and aircraft.

Russia has trained a large number of Chinese during the last five years, as engineers for different lines including mining, electrical equipment, and atomic power production. Now, the Chinese report they have nearly 800,000 engineers and technicians to build up their industries in the same lines as the Russians. Actually those are copies of American and European equipment.

They lean more to the European production lines and experience, however, because they are better acquainted with those. For example: The Skoda Works, in Prague, was originally under German control, and is known to have one of the finest workshops, not only in the machine tool line, but also for large guns and gun sights. After World War I, this company was brought under the operation of the French Schneider Co., and in 1935 again came under German control. This company is really the backbone of the Russian machine tool industry and will be one of our greatest competitors in the Russian export of machines.

Most of the European countries have contributed a lot to our American industries. In the olden days, England was the leader in spinning machines and ship building. Since World War I, they have built up their machine tool industry to a great extent. Now they are also builders of fine motors and jets, along with their latest achievement of the jet passenger liners, and they have again proven they are a step ahead of us.

Examples of Competition

France learned a lot during two world wars. The machine tool industry is building up slowly, but steadily, and the French are good mechanics. You will remember they were one of the first to build automobiles with gasoline motors, and

for the first couple of years we had to import our castings for the gasoline engine from the French. They are also catching up fast in fulfilling their requirements for anti-friction bearings, plastics, and all necessary parts for automobiles. The French cars are mostly the small size, but they are well liked for their riding quality and economical use since they are gasoline savers.

The Swiss are still the leaders for watches, but they are also well known for high precision automatic machines of the smaller sizes and jig borers. The Swiss Fisher Co. was the first to produce a heavy-duty production lathe with hydraulic tracer units to copy and turn shafts from a template.

Italy has advanced fast since the last world war. The Fiat Co., which is the largest automobile manufacturer in that country, controls most of the Italian factories and they are also great producers of machine tools. They copy a number of American and German machines, especially those required for the ball bearing manufacturers.

The Villa Perosa Plant, which is also controlled by Fiat, is a well known ball bearing factory. They installed two large factories in Russia before 1940, where they furnished all the special machines of their own make except the automatic bar and chucking machines, which were furnished by The National Acme Co. and the Pittler Co. of Germany.

The other countries such as Sweden and Holland are getting more and more into the line of building their own machine tools. Perhaps you can picture for yourself what competition we have to meet now and in the future, especially in the European Free Trade Areas.

Rebuilt . . . and Better

I had the opportunity to visit most of the European countries immediately after the war, and I saw cities and factories completely destroyed. To show you what they have accomplished in the last eight years, since they have been permitted to rebuild their own countries, think of the Volkswagen Co., producing 2200 cars/day now and anticipating 3100/day by January 1959 . . . and they are still quoting about one year behind on deliveries.

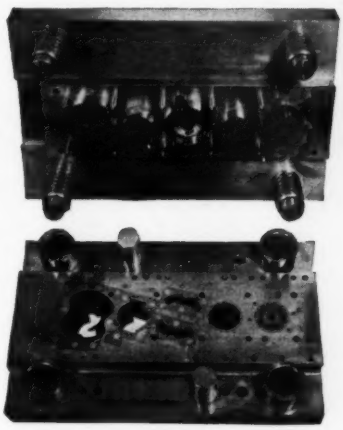
To summarize, here are some interesting points to remember about modern European engineering:

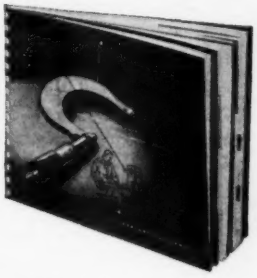
• Forced to deal with short runs, the foreign tool engineer adopts modi-

. . . Continued on page 16

DO YOU REQUIRE PRECISION HIGH-PRODUCTION DIES?

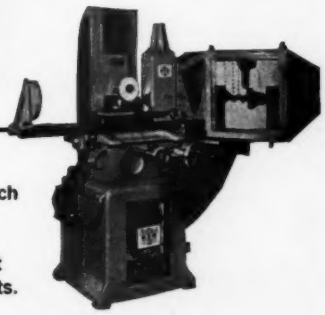
CLEVELAND TOOL and DIE COMPANY SOLVES YOUR PROBLEMS and meets your most exacting tool and die requirements. Cleveland Tool and Die Company has built individual dies which have produced millions of precision tolerance pieces without retooling. SEND FOR THIS FREE BROCHURE DESCRIBING OUR FACILITIES.





FREE Brochure
Describes Facilities
available. Send for your free copy today. No obligation, of course.

Typical lamination die custom-made at Cleveland Tool and Die Company. Dies like this, dies for powder metallurgy and other special purpose dies are made by skilled craftsmen using the most modern techniques and facilities.



Typical of the modern facilities employed is VISUAL GRIND, which permits contour grinding of your dies without stopping to consult a comparator. Eliminates stop and start grinding, saves time, cuts die costs.

CLIP and MAIL THIS COUPON TODAY

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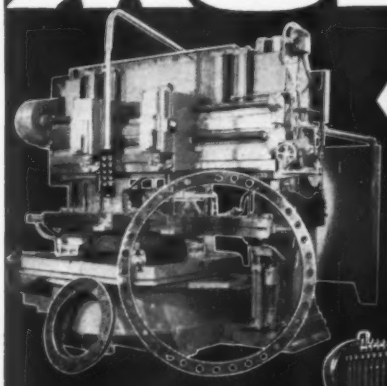
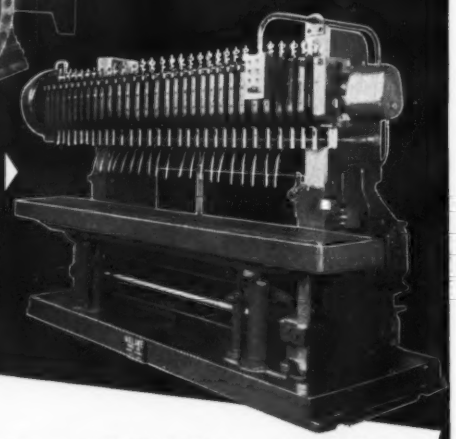
CIRCLE INFORM-A-GRAM KEY NO. 15

MOLINE



HD68 drills bolt circles from 12" to 100" diameter. Each of the two spindles has capacity for 2½" drill in steel. Operating cycle is fully automatic.



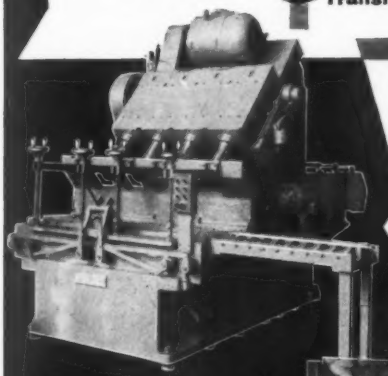
HD13 straight line-type drilling machine with capacity for thirty ¼" drills in steel. Used for work on heavy castings, round and rectangular steel tubes, structural shapes, plates and grader blade drilling or countersinking.

For Greater

PRODUCTION . . . EFFICIENCY . . . SAVINGS

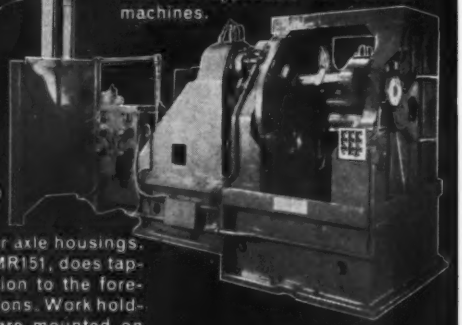
Use an individually designed "Hole-Hog" Machine Tool for such jobs as...

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Transfer-Type and Special Machines



OVER 57 YEARS OF MACHINE TOOL ENGINEERING EXPERIENCE IS AT YOUR SERVICE. TELL US YOUR PARTICULAR PROBLEM

13CB hydraulic feed cylinder boring machine. V-8 engine blocks are rough and finish bored for wet-type cylinder sleeves. Units of this kind are applicable for transfer machines.



MR152 performs drilling, reaming, spot facing and chamfering operations on tractor rear axle housings. A companion machine, MR151, does tapping in addition to the foregoing operations. Work holding fixtures are mounted on power driven trunnion.

MOLINE TOOL CO. MOLINE, ILLINOIS

MOLINE TOOL COMPANY

REPRESENTATIVES IN PRINCIPAL CITIES

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CIRCLE INFORM-A-GRAM KEY NO. 16

. . . Month's Talk from page 15

fied mass production tooling for universal machines.

- Carbide and high speed steels are being used side by side. As you know, Germany brought out the first carbide tool under the name of Widia, manufactured by Kruppa Essen Corp. General Electric made a license agreement with this company in 1932 and they have since improved carbide tools.
- The throwaway bit is becoming more widely used and a newer method being used in Europe is that of glueing the bit to the holder. Glueing seems to give a cushion to the carbide bits.
- Many there have standardized holders for faster change-over.
- They keep center heights in limits for easier setups.
- Ceramic tools are being tested and have been used in Europe since World War I. They were originally used on spark plugs and later The B.S.A. Co. made extensive tests and found the ceramic tools were too brittle for interrupted cuts or for cuts under a welded surface. They worked best on high spindle speeds. Unfortunately, up until now, ceramic tools could not be manufactured uniformly enough for practical use.
- Single point tools controlled by followers are used more than multi-tooling.
- The accepted base for all standardization is the I. S. A. Tolerance system.
- New methods of metal removing are being tested such as spark erosion, ultra sound, and so forth.

VIBRATORY FEEDER MOVES LOCKNUTS INTO HARDENING FURNACE

Parts feeding equipment that insures a uniform flow of locknuts into a carbonitriding furnace, is designed on the vibrating principle and powered by air.

A commercial heat treating firm, Benedict-Miller, Inc., is successfully using the feeder to regulate the flow of locknuts, discharge them easily into the furnace, and minimize maintenance. The washers are fed at approximately 200 lbs/hr. at 25 psi gage pressure.

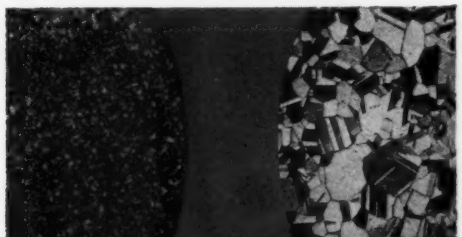
The feeder, built by The Cleveland Vibrator Co., is constructed of high grade heat resistant steel, which makes the hardening furnace application ideal since ambient temperature at the discharge end is 200° to 250° F. Air consumption is approximately 4.0 cfm of free air.

NEW BRASS SPEEDS FINISHING operations for Park Sherman Co.—Formbrite, Superfine-Grain Drawing Brass by Anaconda, reduces polishing time—cuts cost up to 50%—gives clean, easy formability.

TO THE PARK SHERMAN CO., Springfield, Ill., finishing operations are important in giving its line of fine brassware sales appeal—are also weighty cost factors. Switching from ordinary drawing brass to Formbrite, Park Sherman boosted production on the tray of this "Merry-Go-Round" Bar—25% in the cutting operation—42% in finish buff.

THE COVER of this Park Sherman Silent Butler is now made of Formbrite, Anaconda's Superfine-Grain Drawing Brass. Polishing operations in preparation for chromium plating are 50% faster than with ordinary drawing brass.

PRODUCTION INCREASED 47% in finishing operations on this Park Sherman Sta-Put ashtray after the shift to Formbrite. Products shown are only three of many Park Sherman products now made of Formbrite.



THE SECRET of Formbrite's superior polishing characteristics is its superfine-grain. Micrographs (75X): left, Formbrite; right, ordinary drawing brass.

Wherever finishing is an important cost factor in formed or drawn products, Formbrite in sheet and strip is designed to save you money. In brass wire alloys for cold-heading and upsetting, it gives a stronger, springier, more abrasion-resistant product. For more detailed information, write for Publication B-39. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

5845

FORMBRITE®
SUPERFINE-GRAIN DRAWING BRASS
a product of
ANACONDA®
Made by The American Brass Company

CIRCLE INFORM-A-GRAM KEY NO. 17

FOR THE DIEMAKER WHO HAS EVERYTHING . . .

. . . everything but a good source for die sets,
here's a suggestion.
Die sets are basic to mass production.
They don't need
gadgets, gimmicks or glamorous-styling.
Production depends on
sound design, quality materials, accuracy
and reliability, and
at reasonable cost and delivery time.
That's the way it is
with Detroit die sets. Why don't you
try them today.

Detroit Die Set builds and stocks over 2,000 different die sets plus specials of all types. Ask for new catalog without obligation.

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OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

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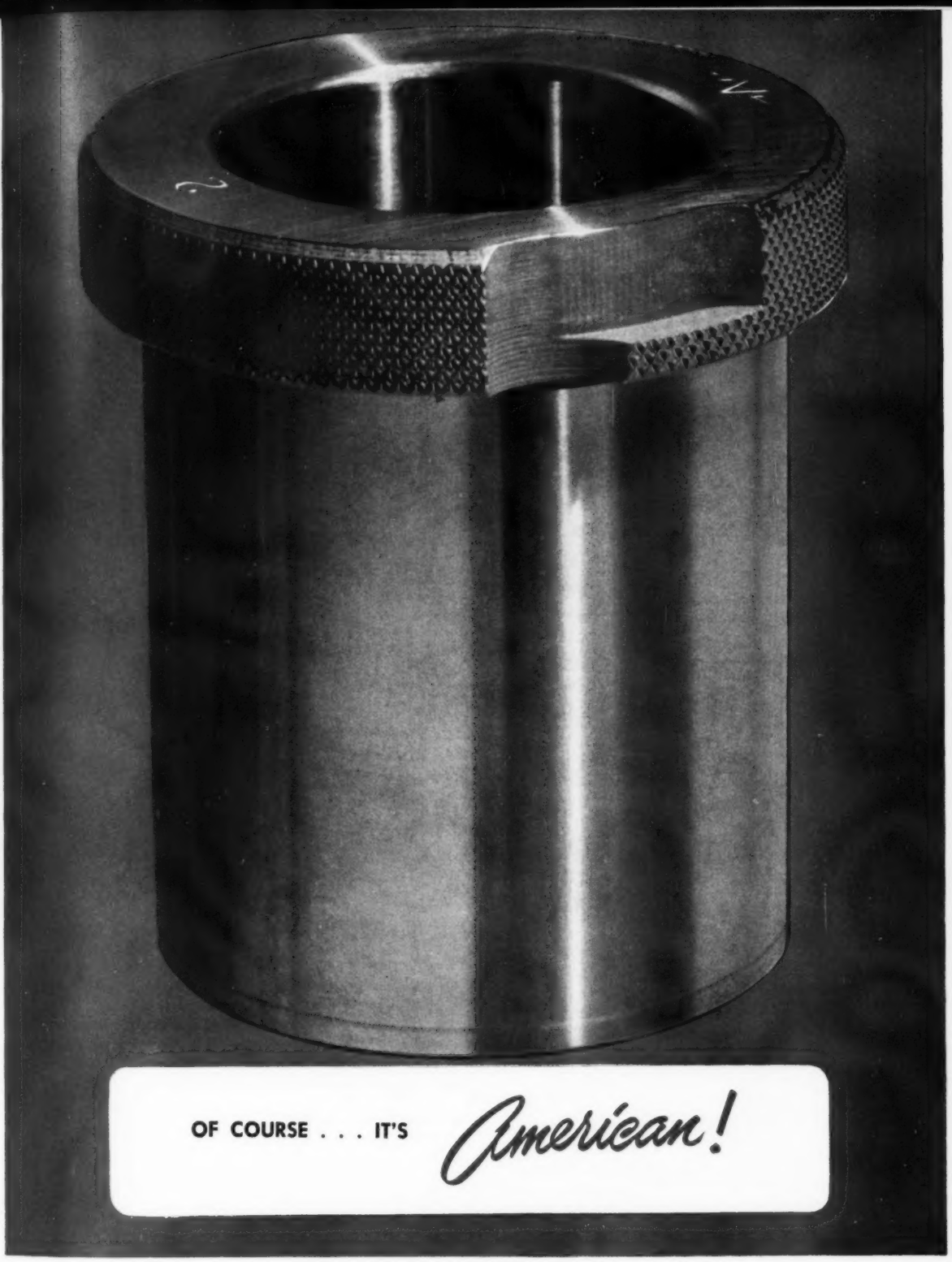

OF COURSE . . . IT'S *American!*

.....Now AVAILABLE the New!

American **REDSKIN**

Patented Drill Bushing for Plastic Tooling

SEND FOR LITERATURE

AMERICAN DRILL BUSHING CO., 5107 PACIFIC BLVD., LOS ANGELES 58, CALIFORNIA

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NOW

FOR DRILLING and CHAMFERING PRIOR TO TAPPING

IMMEDIATELY AVAILABLE—

ALL PRACTICAL SIZES—IN 3 STEP LENGTHS 3 SHANK STYLES

with Straight Shank, Tapered Shank or Jobbers Length

Standard SUBLAND DRILLS IN LOCAL STOCKS

Now . . . Mohawk Subland Drills are manufactured in *all* practical *standard* sizes, in 3 step lengths and 3 shank styles—to meet all drilling-chamfering requirements. And, Mohawk Standard Sublands sizes match accepted industry practice on unified thread sizes, hole tolerances, etc.

Why? Because Mohawk Standard Sublands affords a faster, more accurate, economical method of simultaneously drilling and chamfering clean, concentric holes for better tapping operations—plus a saving in tap costs.

Mohawk Standard Subland Drills are available direct from your local distributor's stock—immediately! Start saving production time and equipment dollars today. Call the Mohawk man right now!

Just off the press! This new 12-page Catalog illustrates the multiple advantages of Drilling and Chamfering (prior to tapping) with Mohawk Standard Subland Drills. Lists all practical sizes, types and suggests a simplified method of determining your requirements—more economically. Yours for the Asking!

worlds largest producer of Sublands

Mohawk TOOLS, INC.

MONTPELIER, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 20

MANUFACTURING MEMOS

And It Floats! . . . Steel that will float on water seems far-fetched, but the Crosley Division of Avco Mfg. Corp. has come up with Avcomb, a stainless steel honeycomb sandwich structure for high speed aircraft. The material, about ½″ thick, has the same strength as stainless steel of the same thickness, but weighs only about a tenth as much.

Tough Stuff . . . Investigate shooting at Houghton Laboratories, Inc. Report: 38 calibre bullet shot from 30″... Hit high impact strength Hysol epoxy resin-glass laminate . . . Didn't penetrate . . . Bullet mark easily removed. . .Laminate cures in 24 hrs at room temperature . . . Makes economical fabrication of flat and complex shapes without presses. . .that is all.

Light Flight . . . Planes will be slightly lighter this season because the aircraft industry is using about 20,000,000 titanium alloy fasteners — screws, bolts, and rivets — instead of the steel type, as a result of the study-evaluation contract placed by Air Materiel Command with Northrop Aircraft Inc. With titanium, there's a 35% fastener weight reduction per aircraft.

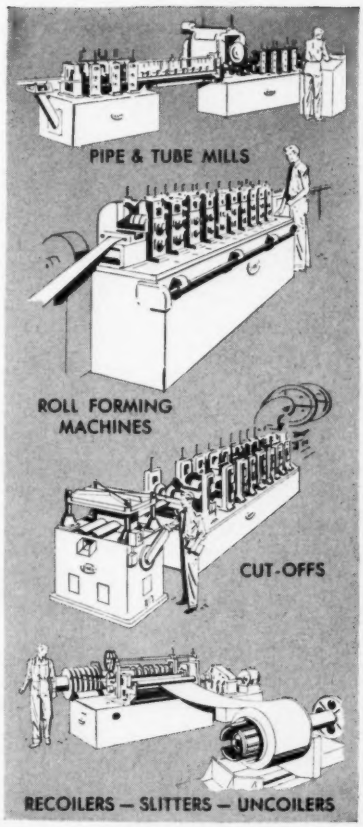
Fixture Fixin's . . . Tool Designers, here's a kit from Standard Parts Co. that when demonstrated will save you tooling time and money. The "Jig in a Jiffy" kit has the basic fixture bodies for designing and building drill jigs, milling fixtures, tumble box jigs, and other machining fixtures. Standard Parts will show you their cost cutting ideas; write to them at 1000 Broadway, Bedford, Ohio.

Info Please . . . Confused about the specs for the different stress-relief treatments of aluminum alloys? The Aluminum Assoc. has given new designations to the alloys to help clarify their uses. For information, write the association at 420 Lexington Ave., New York 17.

There's also a new standard for diamond dressing tools. The American Society of Tool Engineers' guide gives classification, designation, definition, and shank dimension tolerances for the tools used for dressing or trueing grinding wheels. This is another boost for economic manufacturing through standardization.

Short Runs . . . If you have a small-lot production run problem revolving around aluminum shapes, contact The Midwest Aluminum Corp., which specializes in this type of work. They've also got an Idea Kit, with different extruded aluminum shapes to play around with that helps you dream up short cuts, simplify products, and assemble them with a minimum of fastenings. Prospective users can consult the company for design suggestions, too.

PMI Honors Two . . . For their developing methods and equipment to roll high quality strip out of metal powder, this year's Pressed Metal Institute Pressed Steel Award went to Richard A. Smucker, E. W. Bliss Co., and Ralph J. Perrine, Electric Furnace Co.



YODER MAKES THEM ALL

. . . Complete equipment lines for heavy or light production!

Uncoilers, slitters, roll-forming machines, cut-offs, pipe and tube mills, special machinery for ferrous or non-ferrous metals are all made and engineered by Yoder to fit your specific requirements.

Special attachments and auxiliary units can perform additional operations such as welding, coiling, punching or embossing without extra labor cost while increasing production speed.

Let Yoder engineering and "know-how" help you get the most from your plant . . . with Yoder equipment. For full details, write to:

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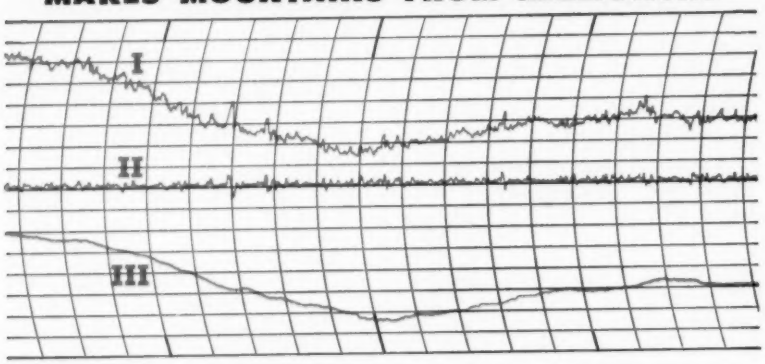
ENGINEERING YODER MANUFACTURING PIPE AND TUBE MILLS (ferrous or non-ferrous)

CIRCLE INFORM-A-GRAM KEY NO. 21

PROFICORDER®

MAKES MOUNTAINS FROM MILLIONTHS

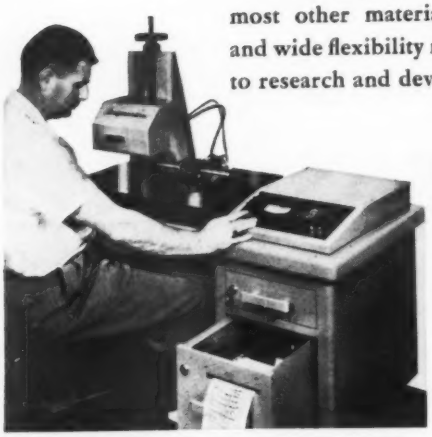


Three Proficorder records of same portion of a surface, reproduced ½ size, showing (I) total profile, (II) roughness profile, and (III) waviness profile. Note range of detail.

THE PROFICORDER draws a magnified profile of machined and finished surfaces, showing the *height, width* and *relative position* of the surface irregularities. It clearly shows any desired detail from over-all contour to fine roughness. Accordingly —

These charts permit detailed study and comparison of waviness . . . roughness . . . porosity . . . flaws . . . wear . . . and the effects of finishing processes.

The Proficorder will show (I) the total profile, (II) roughness alone, or (III) waviness, steps and other widely-spaced irregularities with roughness omitted. It is used on metals, paper, plastics, ceramics, and most other materials. Ease of operation and wide flexibility make it especially suited to research and development work.



FREE
BULLETIN LT24
gives details. Write for it! And let us furnish you with profile charts of surfaces in which you are interested.

Proficorder is a registered trade-mark.

Made by the Profilometer® people —

MMC®
MICROMETRICAL MANUFACTURING CO.
339 S. MAIN ST. ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 22

MANUFACTURING MEMOS

New Company

The new Holden Engineering Co., with Al Holden as president, offers complete testing and research facilities for air and hydraulic components, and boasts a complete stock of all sizes and types of cylinder spare parts.

New Plants

Cam making and jig boring contract services are now available in Kidde Precision Tool Corp.'s new plant in Roseland, N. J. It's equipped for the type of work required for atomic and missile components.

Pratt & Whitney had more efficient service and fast delivery in mind when they constructed the new precision tool warehouse in Cleveland. The 4,000 sq ft building stocks standard cutting tools and conventional gages for this area.

Needed assembly space for its larger press brakes and straightside presses is now available in the new 16,500 sq ft addition built by Dreis & Krump Mfg. Co.

Old Timer

C. W. Marwedel, San Francisco's oldest — 75 years — industrial tool and supply company, was honored recently as the oldest Norton Co. distributor.

On The Move

Expansion and better service promoted the move from Los Angeles to Rockford, Ill., by The Mettler Co., Inc., Division of Eclipse Fuel Engineering Co.

Headquarters for Bryant gages and surface plates has shifted from Springfield, Vt., to the Ex-Cell-O plant in Greenville, Ohio.

Remodeling Job

Herman Stone Co. has installed new equipment for relapping granite surface plates up to 3' x 4', in its Dayton, Ohio, plant.

Carbide Agents

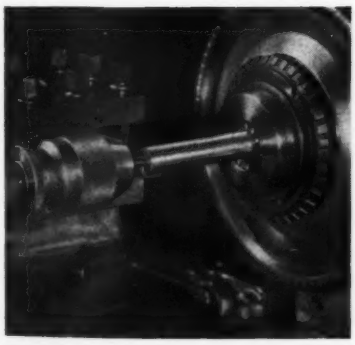
A. Milne & Co., Inc., tool and special steel distributors, are agents for Sintercast Corp.'s new machinable carbide, Ferro-Tic, in Massachusetts, New Jersey, New York City, Pennsylvania, West Virginia and Northern Illinois.

Name Change

Hunt Valve Co. is the new name for the C. B. Hunt & Son, Inc., manufacturers of air and hydraulic control valves.

Drilling bar stock to close tolerances in I.D. at the Hartford Special Machine Co.

"The Jacobs Rubber-Flex Collet is the best collet I have ever used"



Albrecht Keyless Chuck and Jacobs Rubber-Flex Collet Lathe Chuck team up on center drilling job.

Mr. Shaler Rundberg drills steel bar on LeBlond Dual Drive 12" Lathe equipped with a Jacobs Model 91 Rubber-Flex Collet Chuck at head stock, and an Albrecht Model 130 J6 Keyless Drill Chuck at the tail stock. He often works with highly polished or finely ground parts. He says:

"The Jacobs hand wheel type lathe chuck lets me chuck polished or ground parts for additional operations without marring. The Rubber-Flex Collet is the best collet I've ever used."

You hold your work with the tightest, most accurate grip ever devised when you hold with the Jacobs Rubber-Flex Collet. Ask your industrial supply distributor for Bulletin 57-CC on the Model 96 Key Type Collet Chuck shown here and for Bulletin 57-LC on the Model 91 Hand Wheel Collet Chuck.

Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks . . . first in service.

Jacobs CHUCKS

The Jacobs Manufacturing Company, West Hartford, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 23

HIS JOB

....TO BUILD YOUR PROFITS!

THE *Roto-Finish* CUSTOMER'S MAN

There's nothing unique about stressing product quality. But, at Roto-Finish we have an added incentive. The success of the Roto-Finish Customer's Man *depends* on providing the kind of dependable, mass-production finishing service which builds customer satisfaction, and results in a steady repeat business.

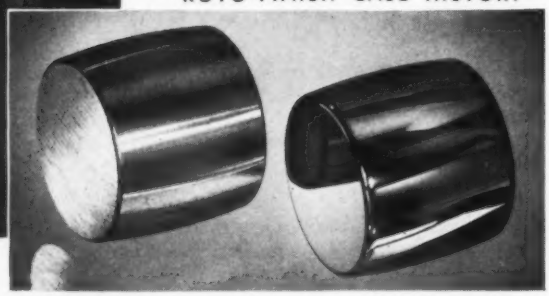
TRIAL AND ERROR FINISHING IS COSTLY

If you're now barrel finishing, our Customer's Man will welcome an opportunity to work with you in your own plant to show you how to get the finish you want, faster, and at lower cost.

If you're hand finishing, he can show you how to save up to 80% of your present finishing costs.

WANT PROOF? Then write or phone your Roto-Finish Customer's Man today.

ROTO-FINISH CASE HISTORY



*This photo is unretouched.

MATERIAL: Bearing steel, 61 Rockwell C Scale.
DIMENSIONS: 1.213" dia. x 1.015".
FINISH BEFORE: Ground to 10 RMS.
FINISH AFTER PROCESSING: 2 to 4 RMS,
(with no dimensional change).

Roto-Finish COMPANY

3729 Milham Road
KALAMAZOO, MICHIGAN
Phone: FIreside 3-5578

ROTO FINISH

FOREIGN REPRESENTATIVES: ARGENTINA—Taller—Buenos Aires ● AUSTRALIA—A. Flavell Ltd.—Cheltenham ● BRAZIL—Commercial E. Industrial de Fornos Werco, Ltd.—Rio de Janeiro ● CANADA—Canadian Hanson & Van Winkle Co., Ltd.—Toronto ● ENGLAND—Roto-Finish Ltd.—Hemel Hempstead ● FRANCE—Societe Roto-Finish—Paris ● GERMANY, AUSTRIA, NORWAY, SWEDEN, SWITZERLAND—Metallgesellschaft A. G.—Frankfurt, a. M.—Germany ● HOLLAND, BELGIUM, LUXEMBURG—N. V. Roto Finish Maatschappij—Delft, Holland ● ITALY—Societa Roto-Finish a R. L.—Milan ● SPAIN—Instituto Electroquimico, S. A.—Barcelona

CIRCLE INFORM-A-GRAM KEY NO. 24

MANUFACTURING MEMOS

New Line

A new pneumatic product line, a first with C. A. Norgren Co., is set to go. They'll start with a series of 2-way and 3-way solenoid valves and a series of midget 2-way solenoid valves.

Changed Hands

The former Bostitch, Inc.'s plant in Pawcatuck, Conn., was recently bought by The Raytheon Mfg. Co.

Checkout equipment and simulator - programmer production and engineering facilities will be housed in a newly - acquired plant by Magnetic Amplifiers, Inc. in El Segundo, Calif.

Hevi-Duty Electric Co. has added more fuel to the fire with the recent purchase of the Stroman Furnace & Engineering Co. from The Peterson Oven Division of Baker-Perkins, Inc.

Acquisition of the Industrial Gauges Corp. has been announced by Daystrom, Inc., electronics manufacturer.

Coming Events

Dec. 1-5. 23rd National Exposition of Power & Mechanical Engineering, Coliseum, New York.

Dec. 3-5. National Association of Manufacturers' 63rd Annual Congress of American Industry, Waldorf Astoria Hotel, New York.

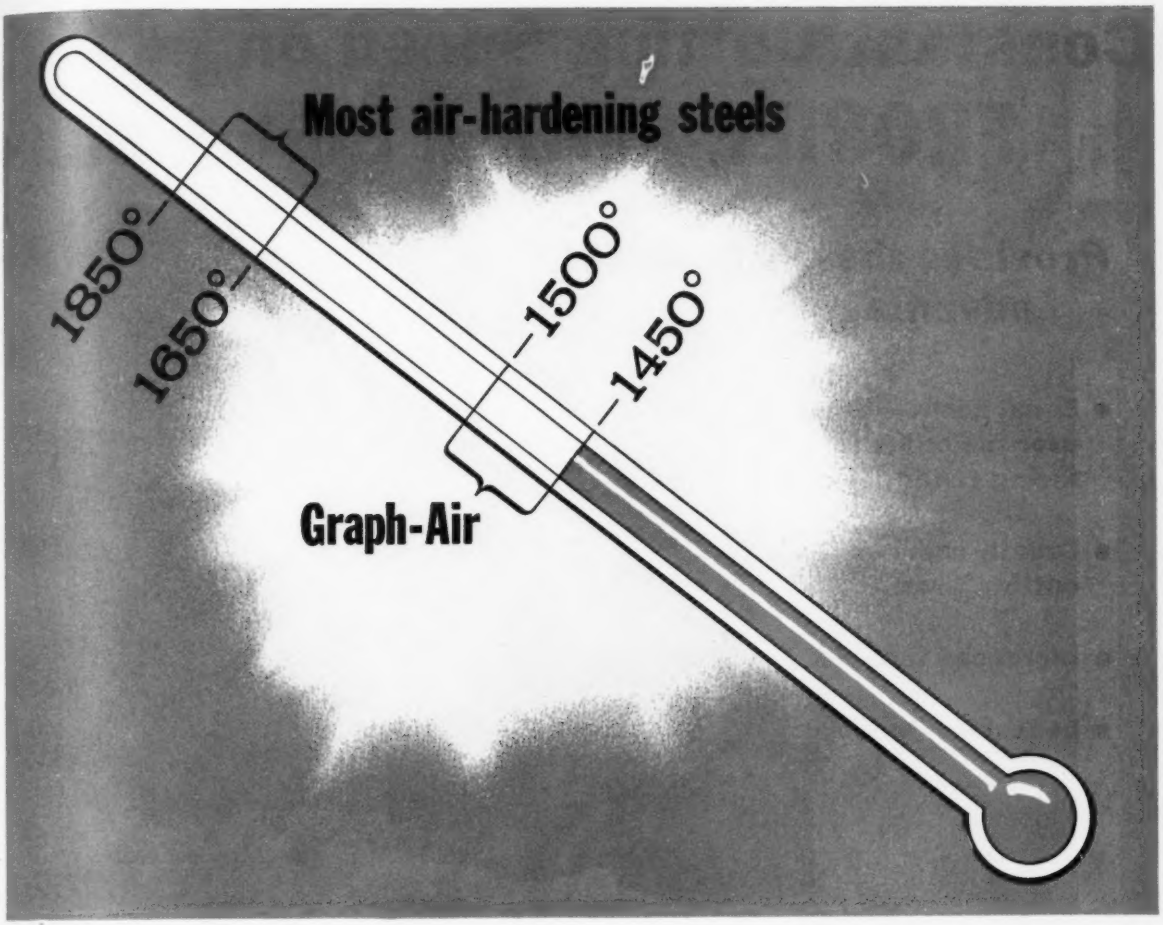
Dec. 3-5. American Institute of Mining, Metallurgical, and Petroleum Engineers' Electric Furnace Steel Conference, Hotel Statler, Detroit.

Dec. 4-5. Illinois Institute of Technology's Industrial Engineering Conference, Illinois Institute of Technology, Chicago.

Dec. 8-10. American Nuclear Society's Winter Meeting, Sheraton-Cadillac, Detroit.

Dec. 28-31. American Marketing Association's Winter Meeting and Exhibit, Morrison Hotel, Chicago.

The Inform-A-Gram Card follows page 84 in this issue. Use one card for your inquiry, give the other to an associate.



Graph-Air®... *lowest-temperature air-hardening tool steel reduces distortion*

TEMPERATURE as low as 1450°F. is high enough to air-harden Timken Graph-Air® tool steel. That's as much as 400° lower than most other air-hardening tool steels. Because of this, you reduce distortion and simplify heat treat control. And surface scaling and decarburization are minimized.

Graph-Air machines faster, too, because of its graphitic structure. And it's tougher—outwears ordinary tool steels because of the uniform, diamond-hard carbides in its structure.

With Graph-Air you get longer-lasting accuracy because of its built-in stability. Graph-Air is one of the "family" of Timken Company graphitic tool steels, the most stable ever made.

And the uniformity of hardening and reduced distortion you get with Graph-Air make possible more intricate sections. It's ideal for blanking dies and other parts that must stand up under abuse.

For a high quality tool steel that air-hardens at lowest temperature, specify Graph-Air. Available in solid and hollow bar sizes. For further information, please write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN *Fine Alloy* **STEEL**

TRADE-MARK REG. U. S. PAT. OFF.

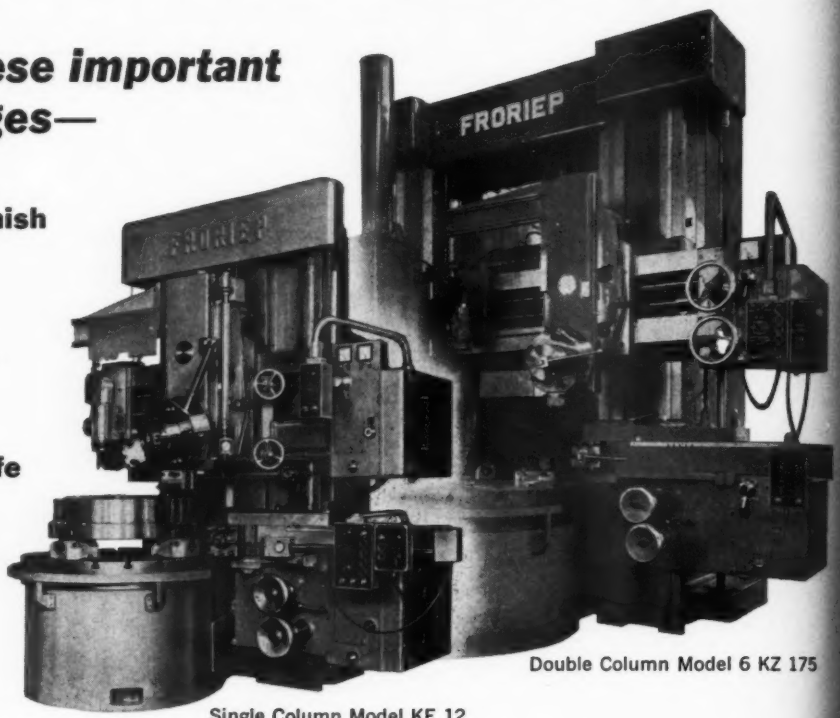
SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

CIRCLE INFORM-A-GRAM KEY NO. 25

Constant Cutting Speed on FRORIEP Vertical Boring Mills

Provides these important advantages—

- **Equal surface finish over the entire facing range**
- **Greatly reduced cutting time**
- **Increased tool life**
- **Less down time**



Double Column Model 6 KZ 175

Single Column Model KE 12

Electro-magnetic clutches on a FRORIEP let you maintain constant cutting speed—regardless of decreasing diameter. By a remote electric control you can change quickly to any available speed—without stopping the table. You can adapt table revolutions instantly to the most economical cutting speed for any diameter. If desired, speed can also be set to change automatically, gradually increasing as cutter moves toward the center—and without interrupting the cut.

Uniform surface finish produced by a Froriep

Simple, conveniently placed push buttons and switches control feeds and rapid motion of turret, cross rail and side arm. Cross rail head and side arm operate independently with 12 pre-selected feeds each.

An electric tracer attachment will copy 90° in and 90° out, reproducing almost any shape but undercuts. Automatic tripping devices and combined taper-turning and threading attachment add even more versatility.

Capacities Available Single column models provide a choice of table diameters from 40″ to 63″; double column models from 69″ on up. Special designs also available on request.

Write For More Information

COSA — *nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 26

ANOTHER CUSHMAN AIR CHUCK AT WORK!

Hold it right and machine it faster with:
CUSHMAN air operated chucks
rotating air cylinders
manually operated chucks
power wrench chucks and power wrenches
pinch jaw chucks—hand and automatically operated
boring mill and face plate jaws

CUSHMAN CHUCKS,
a product of American quality,
labor and materials.

Sold through
your industrial
distributor.

THE CUSHMAN CHUCK COMPANY

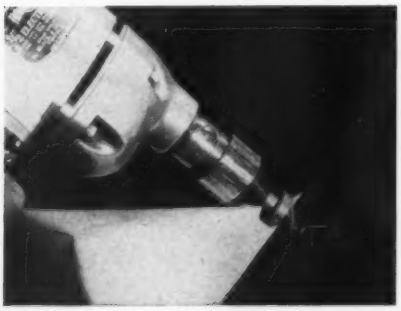
hartford 2, conn.

INGENIOUS NEW... UNIVERSAL R&R DEBURRING TOOL

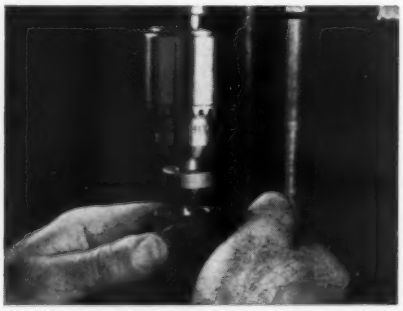
with spring loaded retractable blade eliminates chatter gives precision-cut edge or chamfer at high speed

The cutting action of Model 955 Universal R&R chatterless Deburring Tool (on the left) is effected by spring tension against the blade. On Model 956, right, the spring tension is against the body. This is adjustable to regulate the depth of cut. The blade is free-floating to allow self-alignment and uniform stock removal.

The new Universal R&R Tool makes a handy horizontal deburrer when used with a portable drill held in a vise. With proper adjustment, the R&R Deburring Tool is CHATTERLESS. A new design allows the bearing angle of the tool body and the blade to be in continuous contact with the work piece at all times.



R&R Deburring Tool used in electric drill as a portable unit for heavy plate or other objects too heavy to handle. Blades of the R&R Deburring Tool are replaceable at nominal cost from stock. They are made of high speed steel, precision hardened and ground to close tolerances for interchangeability.



Used in any standard drill press at the high operating speeds recommended by the makers of high speed steels, the R&R Deburring Tool performs most efficiently. High operating speeds mean more production, lower costs. Each tool is made in a full range of sizes to 1½" diameter.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8, MICHIGAN

209

CIRCLE INFORM-A-GRAM KEY NO. 28

Talking About Die Sets

with
Phil Marsilius
Executive Vice-President
The Producto Machine Co.

Die Set Maintenance in the Pressroom—The vital die-maintenance procedures required periodically when a die is removed from the press for sharpening should be coupled with systematic die set inspection and maintenance in the pressroom.

In addition to having a planned schedule of lubrication (based on any of the methods previously discussed in this space), you can make sure of getting the most out of your investment in die sets—and the costly dies and presses with which they are used—by following a simple set of procedures for inspecting and maintaining die sets in the pressroom.

Although there are no hard-and-fast rules that can be established for all die sets, the procedure listed below is generally followed at leading stampings plants in the East. These companies point out that die sets used in the cutting of extremely thin material or for very critical parts would naturally require a more stringent inspection than those used for blanking heavy material or for comparatively simple parts.

At one plant, specializing in long runs of close-tolerance parts for the electronics industry, the procedure followed is:

1. No inspection of the die set during production run unless, of course, there is overheating, pick-up on the guide pins or other obvious difficulties.

2. When the die is taken off the press for sharpening or maintenance, the die set is visually inspected for pick-up or score marks on either the guide pins or bushings. Pins and bushings are carefully cleaned to remove excess lubricant.

3. After approximately 1,500,000 strokes, the set is thoroughly checked for wear on both the pins and bushings. On the average, up to .0003″ wear on pins and bushings is allowed before replacement with new components is scheduled. In addition, the die set is placed on a surface plate and an indicator is placed over one end of the set. An attempt is then made to rock or twist the set by hand to establish how much the die set can be deflected. On a 10″ set, a maximum of .005″, but usually less, total deflection is allowed.

Because the die set plays such an important part in prolonging the accuracy and lifetime of a die, it pays to take the little extra time required to do justice to die set maintenance in the pressroom.

4. During regular or periodic regrinds, the die set is not checked for bent or distorted punch and die holders unless the die has been damaged or there is reason to believe the set may have warped.

During the overall period, if the pins and bushings are replaced, the punch and die holders themselves are checked for warpage or distortion. If necessary, these components are reground prior to assembling the new pins and bushings.

Four-stage blanking and shaving die, Lenkeit Machine & Tool Co., Inc.

pressroom foreman prefers Producto die sets

They keep his downtime down

Keeping production *up* and downtime *down* is the main job of the pressroom foreman. He knows Producto die sets can help him do this job successfully because they maintain accuracy for long runs. All catalog steel sets are annealed to prevent distortion.

He is aware that Producto can provide him with any type of die set he needs—whether for standard or special presses—in a wide range of sizes and thicknesses, with or without clamping flanges.

The pressroom foreman knows that Producto guide pins are mirror-finished to eliminate scoring, and that Producto die sets are available with a variety of lubrication devices to keep them "running cool".

He knows, too, that he is not restricted to the use of predetermined press stroke or shut height because Producto offers an unlimited choice of pin and bushing lengths. Moreover, he can get the bolster he needs to protect his die at the same time he gets his die set. Both die set and bolster can be ordered in steel or cast semi-steel depending on strength requirements.

The pressroom foreman realizes that Producto Qwik-Fit Die Sets make "take-apart-and-put-together" easy during die maintenance. He also knows that Qwik-Fit removable pins and clamp-type bronze bushings are available when the application calls for them.

He can *produce more* with Producto die sets. So can you.

A WEALTH OF DIE SET KNOWLEDGE is packed into Producto's Catalog No. 11 and regular issues of *Die Set Digest*. Write today for these free aids.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Avenue, Bridgeport 1, Connecticut

PRODUCTO

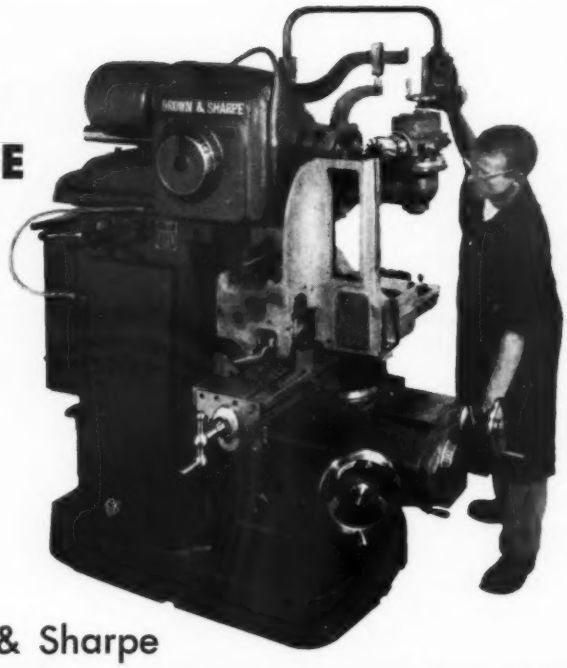
Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

'way out ahead in WORK RANGE -in OPERATING ECONOMY

For tools, dies, molds, for prototype work, for maintenance, for any milling job—



COMPARE this capacity!

28" Table feed
12" Transverse feed
25" Face of column to center line of vertical spindle
20½" Vertical feed
3½" Hand movement of quill in universal head

Spindle Speeds
Horizontal Spindle
40 to 1530
Universal Head
80 to 3060

The Brown & Sharpe RANGEMASTER®

Universal & Plain Milling Machines — sliding head type

LOWER ORIGINAL INVESTMENT

On the RANGEMASTER you can take No. 2 size cuts on work pieces whose physical dimensions would normally require the capacity of a more expensive No. 3 or larger size machine.

LOWER SET-UP AND OPERATION COSTS

With the RANGEMASTER you *clamp the work piece once*, then machine all around it—mill, drill, or bore from any angle. You avoid relocating and re-alignment, with consequent risk of errors. You get more hours of machining time, and minimize set-up time.

LOWER TOOLING COSTS

In the RANGEMASTER, both horizontal and vertical spindles have the same standard No. 40 M.M. taper for interchangeability of tooling. One set of tooling serves for multiple operations. There's no need for costly compounding of tool inventory.

Compare all the features of the RANGEMASTER, Universal or Plain Type, and you'll agree it's by far your best buy in its class. For details, write: Brown & Sharpe Mfg. Co., Providence 1, R. I.

Brown & Sharpe

MACHINE TOOL DIVISION

MILLING • GRINDING • SCREW MACHINES
MACHINE TOOL ACCESSORIES

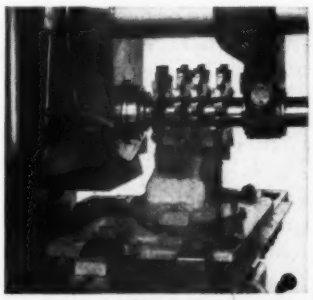
B·S

PROGRESS IN PRECISION FOR OVER 125 YEARS

ALL THE ADVANTAGES OF A "RAM-TYPE" MACHINE WITH NO SACRIFICE IN CUTTING ABILITY

In the Rangemaster, all the following features are the same as in a conventional knee-type milling machine of corresponding size:

SAME SPINDLE MOUNTING —
SAME SIZE "BULL" GEAR —
SAME RANGE AND NUMBER OF SPINDLE SPEEDS —
SAME DIRECT DRIVE to both spindles, utilizing full power



Positioning of sliding head adjacent to the work piece permits mounting of cutters close to spindle nose for improved cutting ability.

MILLING, GRINDING, AND SCREW MACHINES • MACHINE TOOL ACCESSORIES • PRECISION TOOLS • HYDRAULIC PRODUCTS • CUTTERS

CIRCLE INFORM-A-GRAM KEY NO. 30

• FAIRCHILD CORP. • GRUMMAN AIRCRAFT • BOEING
L. MARTIN • PIASECKI • PIPER AIRCRAFT • FORD INSTRUMENT CO. • KENWORTH MOTOR • PACIFIC CAR &
WHITNEY • REPUBLIC AVIATION • AMERICAN CAR & FOUNDRY • CHRYSLER CORP. • ROHR AIRCRAFT • SOLAR AI

Ace Bushing Co., Inc.

10620 WEST NINE MILE ROAD / DETROIT 37, MICHIGAN / LINCOLN 8-0777

THANK YOU, DETROIT!

THANK YOU, MICHIGAN!

We came to you when you were having your problems. We shared them with you. You have given us a wonderful welcome and we appreciate it.

Everyone has been most helpful -- our new neighbors, the Board of Commerce, City and State officials, the Post Office, your Tool Engineers, our old and new customers, even our competitors.

We came to give you the same high quality and unique service that has made us grow from a little western firm to a Nationally-known leader in the drill bushing industry. Our primary purpose is to give you top quality drill bushings at competitive prices exactly when you need them.

So again we say, Thank you, Detroit -- Thank you, Michigan, for making us a part of your community and economy. We pledge ourselves to do for you what we have done in other places.

ACE BUSHING CO., INC.

Alan A. Fisher — President

L. P. Elmendorf — General Sales Mgr.

Bob Jobe — Business Manager

ACE... the Company built upon Rotary International's famous
"FOUR-WAY-TEST"

MOTORS • MARQUARDT • NORTH AMERICAN AVIATION • NORTHROP • CESSNA AIRCRAFT • CHANCE VOUGHT
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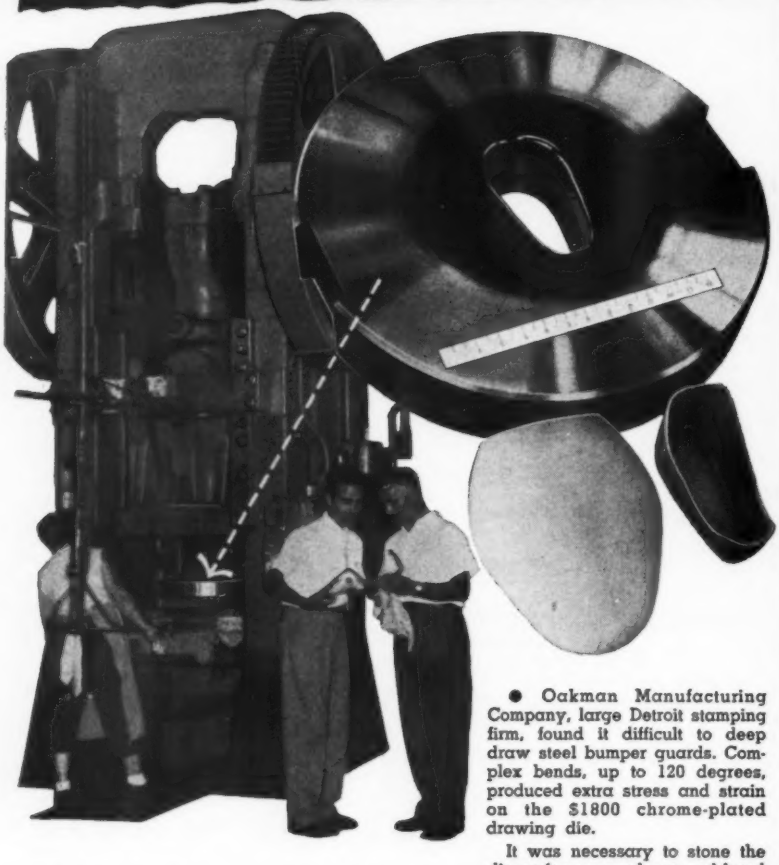
TALIDE DIE SAVES OVER $20,000 DRAWING AUTO BUMPER GUARDS



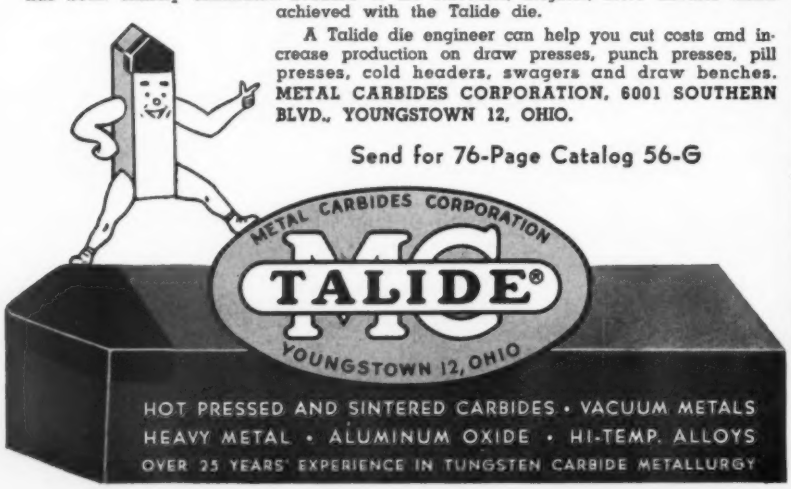
● Oakman Manufacturing Company, large Detroit stamping firm, found it difficult to deep draw steel bumper guards. Complex bends, up to 120 degrees, produced extra stress and strain on the $1800 chrome-plated drawing die.

It was necessary to stone the die surface every hour, and hand polish entire drawing surface after each day's run. The steel die had to be completely reworked and a new chrome-plated surface added after drawing 60,000 parts. Downtime for maintenance made it difficult to maintain production schedules. Maintenance costs soared.

A Grade C-80 Talide die ($2700) was installed 8 months ago. To date it has drawn over 800,000 guards with no wear in evidence. Downtime for die maintenance has been greatly reduced. A buffing operation (25c per piece), previously required, has been entirely eliminated because of the smoother, brighter, more durable finish achieved with the Talide die.

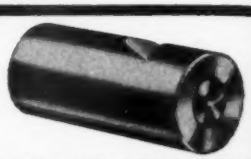
A Talide die engineer can help you cut costs and increase production on draw presses, punch presses, pill presses, cold headers, swagers and draw benches. **METAL CARBIDES CORPORATION, 6001 SOUTHERN BLVD., YOUNGSTOWN 12, OHIO.**

Send for 76-Page Catalog 56-G


METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

SWAGING DIES

Leading Fountain Pen Manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.



HEADING AND EXTRUSION DIES

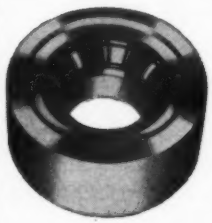
Cold heading ¼" C-1008 rivets, TALIDE dies produced 11,200,000 pieces, other carbide dies only 3,500,000.

CURLING ROLLERS

TALIDE Curling Rolls last 65 times longer than steel rolls on beverage can forming operation.

BLANKING AND FORMING DIES

70 times more paper discs blanked out with TALIDE—over hard alloy die.

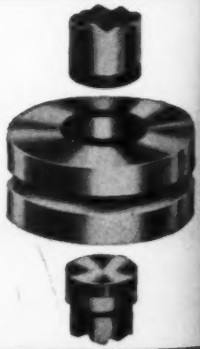


SHEET METAL DIES

137,000 hi-alloy steel pressure vessels drawn with TALIDE against only 7,900 with steel dies previously used.

POWDERED METALLURGY DIES

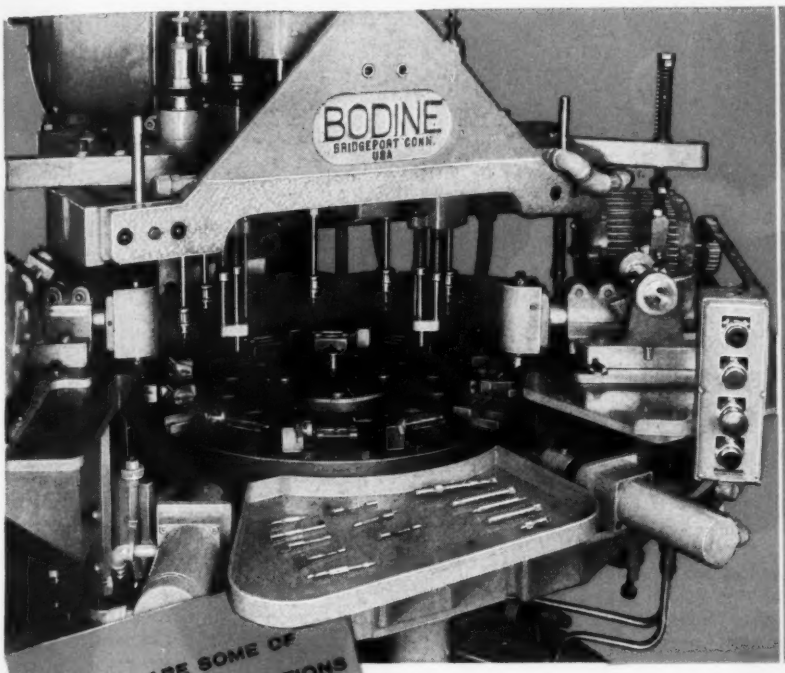
Compacting highly abrasive chemical powders, TALIDE pill dies last 4 months, steel dies wore out in 6 hours.

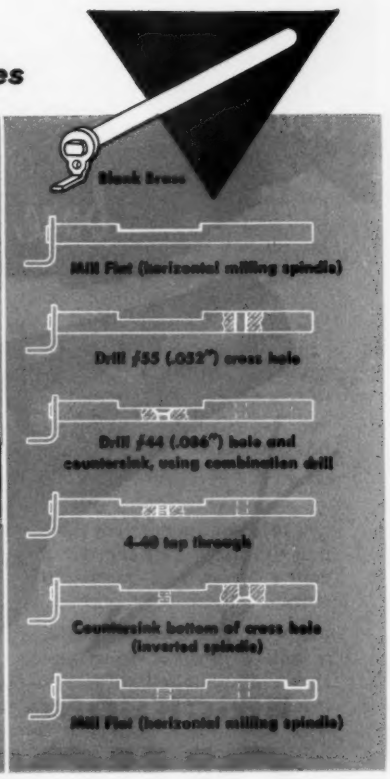


CIRCLE INFORM-A-GRAM KEY NO. 32

Bodine case history no. 47

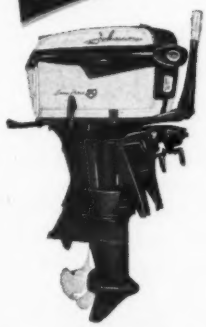
Johnson Sea-Horse throttle shaft in 14 varieties




Blank Brass
Mill Flat (horizontal milling spindle)
Drill #55 (.052") cross hole
Drill #44 (.086") hole and countersink, using combination drill
4-40 tap through
Countersink bottom of cross hole (inverted spindle)
Mill Flat (horizontal milling spindle)

THESE ARE SOME OF THE MANY PART VARIATIONS HANDLED ON BASIC SET-UP

unique BODINE combination tooling like this is part of the "Sea-Horse" saga



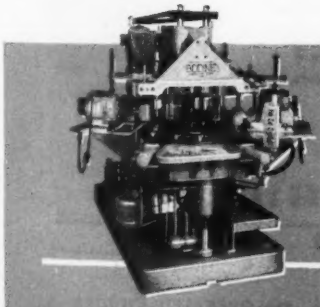
For years Bodine machines and methods have been helping Johnson produce intricate outboard motor parts to high precision standards . . . and within equally close cost limits.

This unusual combination tooling for drilling, tapping and horizontal milling operations is the latest example. No less than 14 variations of these brass throttle, choke and shift parts can be produced on this one machine with fast and simple change-over.

Note the tough holding problem, with holes and flats to be accurately located relative to a crank arm. Note, too, how Bodine swiveling milling heads permit required changes in both width and location of slots. Ready accessibility of tools, indexing table, etc., is obvious. The figures below complete this interesting story . . . and the chances are that Bodine can work out an equally practical and efficient approach to YOUR problem. For further information, write Dept. TP-12.

production data: 550 pieces per 50 min./hr., operating at 11 strokes per minute with manual load and unload.

SBD57

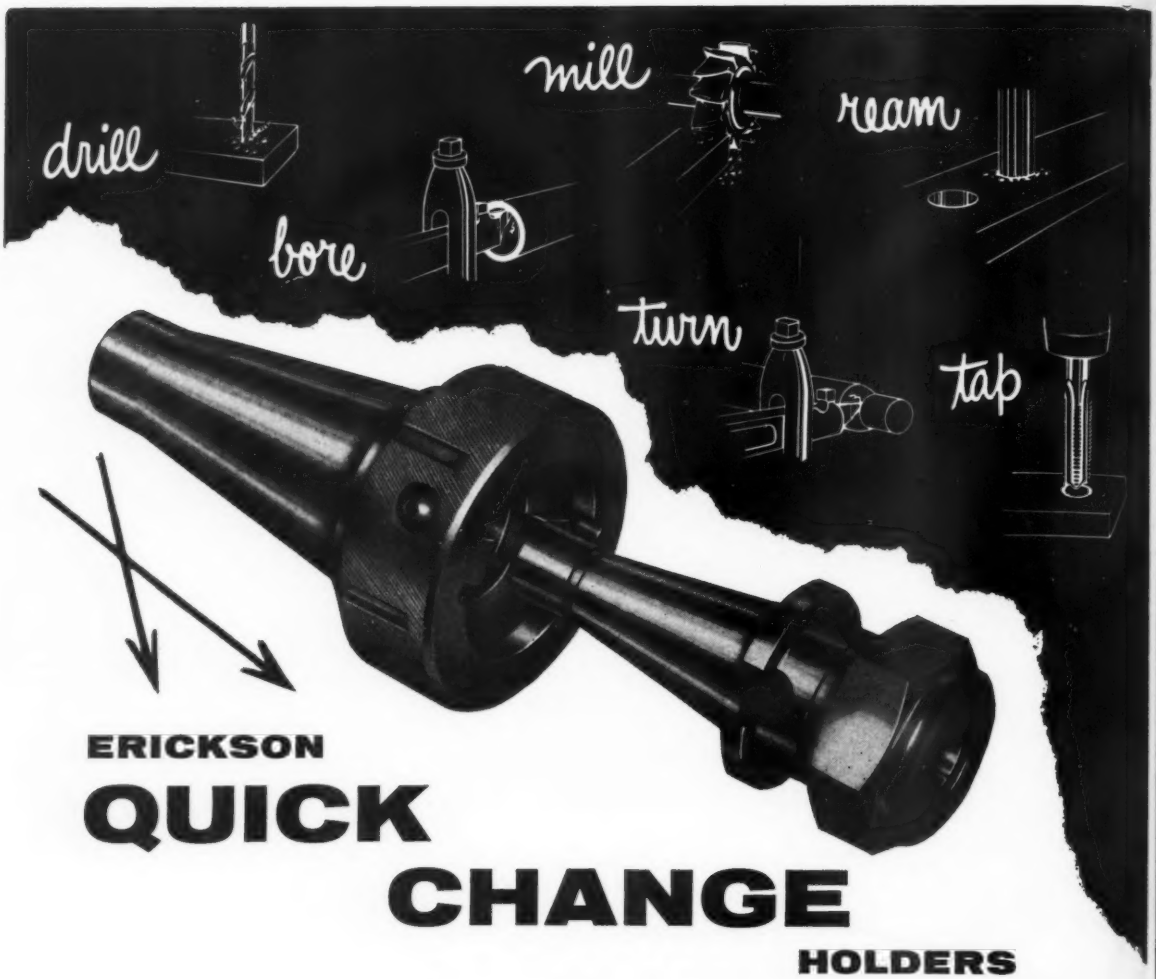


This tooling uses the basic Bodine 42-30 Machine with standardized spindles and horizontal milling attachments. Note how compact this production unit is, requiring only 7' x 8' of floor space.

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 33



ERICKSON QUICK CHANGE HOLDERS

...for use with your standard MMS tapered tools
...designed for presetting of tools

Now you can use your present standard MMS tapered tools with the *new* Erickson Quick Change Holders. That means you get the double production advantage of Erickson's *high precision coupled with the rapid change feature.*

Several different models comprise the line: Morse taper holders for boring mills and radial drills, milling machine holders that fit standard spindle tapers, turret lathe holders that increase turret lathe tool-holding capacity, straight shank holders with #30 or #40 MMS socket. These holders take Erickson Collet Chuck milling machine adapters in both regular and heavy duty types, end mill adapters, shell and face mill adapters, Morse taper adapters, boring head adapters, and chuck adapters for Jacobs internal taper.

AA-7455

A call or card will bring the Erickson representative on the double. Meantime write for your copy of Catalog G "Erickson Quick Change Holders."

ERICKSON TOOL COMPANY

34351-12 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 34

A Q-C HINT FOR 1959

THE FREQUENT PLANT VISITS that editors make are far from a merry round of coffee breaks. Unlike an airplane, a technical magazine can not be flown by the seat of the pants.

We have to get out in the field in order to see what's cooking, what's actually new and successful, and what's giving up the ghost.

How else can we do our job of keeping you advised of the tools, machines and methods that you want to know about in order to do battle with rising costs, to increase productivity of your men and machines, and to insure that when your products are sold they stay sold!

More important, even, than the physical plant and equipment which we crawl through, in, around, and over, are the people we meet. More than what they say, or what their titles imply, it is their attitudes that give us the feel of a given plant and its place in our competitive economy.

People being people, we meet all kinds, from the hail-fellow-all-wet to those who are so dedicated to their jobs that we feel our visit is interrupting the wheels of progress. Invariably, however, it is the ones who are busiest at the most important jobs who so graciously give of their time to indoctrinate us in what they are doing and why.

And whether we, ourselves, report on their accomplishments or prevail upon them to author an article conveying their know-how, it is to them that you are indebted for the technical communications found between the covers of TOOLING & PRODUCTION.

All an editor knows is what he sees, hears, and senses. What he editorializes on is the composite of what he sees, hears, and senses through his contacts with people, who, being people, range from phonies to geniuses. (Sometimes it's quite a challenge to separate the one from the other, and occasionally, simply because editors, too, are people, we "get took!")

In the three weeks just concluded, for instance, this editor has bird-dogged editorial subjects for you in seven plants. These ranged in size from less than 300 employees to over 30,000 — again a rich composite of observations and impressions ranging from parking facilities to chip disposal — from receptionists (wow!) to classified areas — from research to rejects — and from New York to Michigan.

The results of this doorbell-pushing will be packaged for you in TOOLING & PRODUCTION's early 1959 issues — new methods and procedures, cost-cutting innovations, ingenious tooling and production short-cuts.

However, if we should be asked: "What, as a result of all your 1958 plant visits, is the one outstanding and predominant impression concerning 1959's production economy?" we would have to say this:

That more and more of the techniques of quality control, and capability/reliability determinations that industry has mastered for the military, must rub off on the production of consumer goods.

We know full well that the security of our country depends upon the quality, capability and reliability of our military hardware, and with no compromise.

Also, we know full well that the economy of our country depends upon the quality, capability and reliability of our "consumer hardware," which ranges from tractors to automatic orange juicers.

Surely, a fair minimum specification for a domestic appliance, necessity or luxury, is that it should last at least as long as the time payments run. Many of today's examples of our too frequently serviced standard of living won't meet that minimum.

We're perfectly willing to be realistic and not advocate subjecting Mrs. Consumer's automatic dishwasher to the environmental test for a missile gyro — simply because if the dishwasher's environment ranged from a couple hundred degrees below zero to a few hundred above, there'd be no Mrs.!

But when Mrs. Consumer feels, by experience and/or bridge table gossip, that the asking price for an appliance is only the first cost, and is apt to be doubled by virtue of repeated service calls, that appliance becomes a questionable luxury instead of the necessity as claimed in the advertising.

The quality control and capability/reliability standards that are met for the military show what can be done.

The quality control and capability/reliability standards that are not being met for the consumer show what must be done.

Never forget that Mrs. Consumer is your Chief Final Inspector.

E. Willard Pennington

Editor

New Lamina Wear Plates Last Longer, Cost Less!

Now . . . save money and get better performance wherever you have sliding contact between flat metal parts! The principle of bronze electroplated on a steel backing originated with Lamina Bronze-Plated Guide Pin Bushings. Proven during countless millions of punch press hits, it is now being used successfully to produce flat wear plates.

This new concept in wear plate design combines the low cost, ready machinability and solid backing of steel with the long-wearing, non-seizing, free-running properties of a copper-tin bronze alloy. Lamina Bronze-Plated Wear Plates are flat, parallel, and can be easily machined to suit your application. Standard sizes available from stock. End costly wear problems and reduce expensive downtime now! Write for complete information.

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN

MANUFACTURERS OF LAMINA GUIDE PINS, BRONZE-PLATED BUSHINGS AND THE FINEST PRECISION PROGRESSIVE AND LAMINATION DIES.

CIRCLE INFORM-A-GRAM KEY NO. 36

Colonel Preston L. Hill, Chief, Manufacturing Methods Division, stands beside an 18" x 60" rolled sheet of beryllium. This Division of the Air Materiel Command is responsible for developing methods of producing beryllium for ultimate use in aircraft and missiles. Beryllium sheets such as this one have been forwarded to several major aircraft companies for evaluation as to usage and application as the Air Force moves forward into the age of the Mach 3 Air Weapon System and the Long Range Missile.

BERYLLIUM . . .

lighter and stronger than aluminum

stiffer than steel

by Colonel Preston L. Hill
Chief, Manufacturing Methods Division
Air Materiel Command
UNITED STATES AIR FORCE
Wright-Patterson Air Force Base, Ohio

BERYLLIUM IS ONE OF THE RELATIVELY NEW METALS which owes its current prominence to the growth of atomic energy, where its low absorption of neutrons makes it an outstanding material for nuclear reactor applications. More recently, its outstanding lightness and stiffness at temperatures approaching 1200°F have led to many development programs aimed at structural applications in aircraft, missiles and guidance systems.

Editor's Note — We taxpayers wonder where our tax dollars go. Here's a story that doesn't answer the question directly, but you will feel as you read it, the enormity of our government's expense on its R&D efforts for the betterment of our lives and for National Security.

• NEW OR NOT SO NEW

Once called "Glucinium" because of its sweet taste, beryllium was not given its present name and symbol, "Be," until 1828 when Frederick Wohler of Germany succeeded in isolating it, pure.

Its principal use, until World War II, stemmed from the early 1920's when it was found that an addition of 2% beryllium to copper formed an alloy six times stronger than the pure copper. This alloy withstands high temperatures and corrosion, has phenomenal fatigue resistance, is very hard, and is excellent for use in electrical systems. During World War II, its production was expanded rapidly to take advantage of the above alloying characteristics. Meanwhile, a radium-beryllium source provided the neutrons for the historic experiments of Enrico Fermi that led to the discovery of controlled uranium fission. From this small beginning, the Manhattan project overnight created the still bigger, newer market for beryllium in the nuclear power production field. Currently, producers of advanced aircraft and those concerned with space craft are developing ambitious plans for this wonder metal as a structural material. If fulfilled, beryllium will

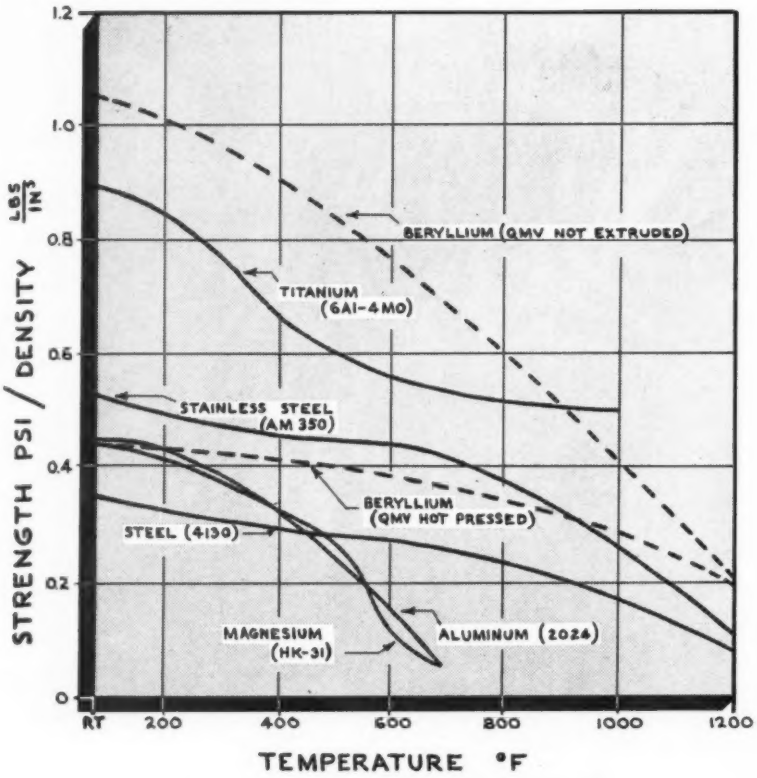


Fig. 1. Yield strength-weight ratio versus temperature for various structural metals.

receive still another boost toward large scale use.

● MECHANICAL PROPERTIES

Beryllium is ⅓ lighter than aluminum and 6.3 times stronger than steel on a strength-weight basis, as shown in Figure 1. Specifically, beryllium has a density of 115 lbs/cf, a melting point of 2345°F, a tensile strength ranging up to 95,000 psi, and a modulus of elasticity of up to 44 million psi. Furthermore, these properties decrease only slightly up to 1200°F. An additional advantage where needed is its stability at high temperatures and its thermal conductivity.

● EXTRACTION

Beryl, the ore from which beryllium is extracted, occurs in sporadic deposits in Southern Rhodesia, India, Brazil and Madagascar. Because no economical extraction process has been devised for separating the beryl from its pegmatite source, the ore must be cobbed (hand-picked and sorted). The industry imports approximately 90% of its beryl ore with a beryllium content of only 3-4%. Domestic low grade deposits of 0.1% beryl have been estimated to be about 300,000 short tons, while world reserves of the same low grade ore are about 4 million short tons. It is understood that a flotation process is being established in Colorado wherein beryl is produced generally as a by-product of other mining operations (mica, feldspar, etc.). The beryl content will average less than 1% in certain pegmatites. In spite of these problems, sufficient beryllium is available for present development programs and other domestic consumption.

● REDUCTION

Domestic producers use the same general process of reduction. Beryllium, in the ore, is converted by chemicals to a water soluble salt that is leached out by washing. This salt is then converted to beryllium oxide (BeO) which is fed to electric arc furnaces that produce the metal. Since the metal is extremely sensitive to impurities, the last stages of the process have to be carried out in a vacuum.

● INGOT PRODUCTION

The product of the reduction process is beryllium pebble. The pebbles are then vacuum melted and cast, the ingot turned on a lathe, the chips reduced to powder, and the powder is blended and hot-pressed under vacuum into blocks. After the ingot has been produced, the material is machined to the desired shape for use in sheet rolling, forging, or extrusion. Other techniques are being investigated so as to simplify this process.

● FORMABILITY

A year ago a beryllium strip and sheet rolling program was initiated by the Air Force. For the first time, sheets as large as 18″ x 60″ with thicknesses from 0.020″-0.060″ have become available. These are being evaluated by airframe manufacturers for potential and to learn their forming characteristics. Production-size sheets with good properties should be available in less than one year for actual use in prototype aircraft and missile systems.

In the present "state of the art," beryllium is brittle and difficult to work into usable shapes. Forging parameters and extruding characteristics must still be established, even by experimental use. The objective at present is to gain know-how.

Joining beryllium to itself and to other metals also presents a problem. The absence of this knowledge is undoubtedly one of the prime reasons beryllium is not as yet being "designed in" in many instances.

However, one manufacturer has produced a fabricated beryllium part. This part was formed from strip beryllium at a temperature of 1050°F. It was then drilled and riveted into a Z-shape to demonstrate that such a brittle material can be shaped under proper treatment (see Fig. 2).

The formability of beryllium is being enhanced by present basic studies, especially those concerning surface effects and crack propagation, and the production of sound fine-grain ingots and mill products.

● MACHINING

Machines and cutting tools of standard design, such as are used for brittle grades of brass, cast iron, mild steel, or heat treated cast aluminum may be used to machine beryllium. However, beryllium metal is somewhat more brittle and abrasive than these materials. Cutting fluids should be avoided whenever possible to permit easy collec-

Colonel Hill, who received his PhD in Chemical Engineering from Ohio State University in 1950, authored this article with the assistance of Lt. M. A. Komertz and Lt. Charles Burley, both project engineers in his Division.

tion and evacuation of chips.

Grain size is the significant factor in determining machinability. Normally, cast beryllium having large grains can be turned, but the surface finish is of a poor quality due to grain orientation. Powdered metal parts have superior surface finishes in comparison to those that are cast because of a smaller grain structure. Of these the vacuum sintered powder is the best. The oxide content of powder metal products is relatively high and abrasive, so that while hss tools are adequate for drilling, turning and milling, their life is limited, and the use of carbide-tipped tools is advantageous. Carbide tool life, when machining beryllium, is comparable to the life of the same tools when machining low and medium-carbon steels — a much longer life than when machining titanium alloys. Tool life varies with cutting speed according to the same empirical relationship applied to most metals. Ceramic tools can be used to machine beryllium with good results.

Although the machining characteristics of beryllium permit it to machine at speeds and feeds similar to those of low-and medium-carbon steels, the actual cutting speeds are determined by the capacity of the exhaust system protecting the operator's health (more later) and method of collecting chips.

Beryllium chip formation is predominantly a brittle-fracture process, irrespective of the cutting speed, feed or tool geometry used; however, some plastic flow of the chip is observed. Chip uniformity and surface finish improve with light feeds and high rake angles, but surface cracking, stick-slip friction and built-up edge formation on cutting tools are phenomena associated with beryllium cutting. Also the temperatures produced at tool-chip interfaces mount rapidly with increasing cutter speeds but this can be helped by increasing the feed-rate. Chip-tool friction is quite low at normal cutting speeds.

In certain cases, e.g., deep-hole drilling, the use of a coolant is desirable. Practice regarding cutting oils and coolants is determined by the relative importance of two factors: 1) whether the beryllium chips are to be reused without a cleaning operation; and 2) the ease with which safety requirements may be satisfied when wet methods are used.

Ordinary soluble oils or emulsions may be used. Also, kerosene of commercial grade has been found satisfactory as a cutting fluid for use in the deep-hole drilling of this metal.

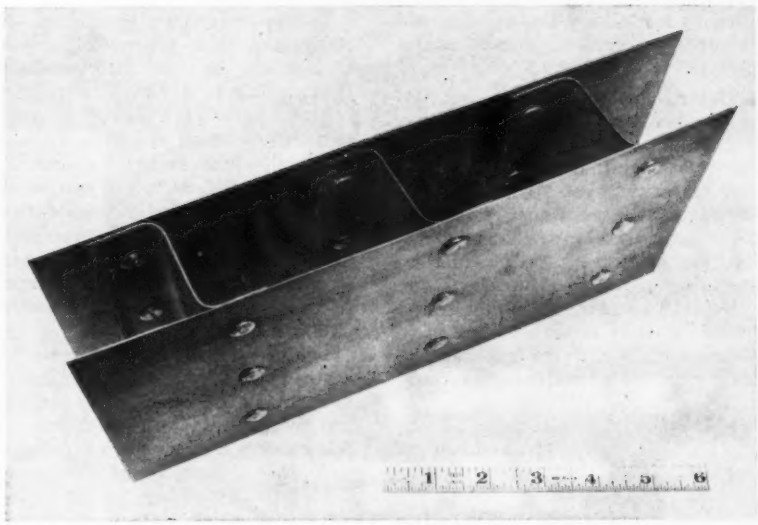


Fig. 2. Little success was realized in bending or riveting until certain problems peculiar to beryllium were overcome. One manufacturer came through with this fabrication.

As with other metals, in all machining operations, thought must be given to the mechanical properties of the material being machined; guard against overstressing, adequately support thin sections, etc.

At the present time sufficient details are not available to permit issuing exact recommendations as to specific tooling required for various machining operations. However, we would be glad to *advise* anyone having questions.

● PROJECTED USAGE

In view of its mechanical properties beryllium will certainly be welcomed into the field of aircraft and missile materials. The constant struggle of strength-weight superiority at elevated temperatures waged by designers and manufacturers should find relief here. Due to the low density of the metal, the total weight of a vehicle can be reduced, thus enabling the payload and range to be increased while simultaneously offering the strength and thermal capabilities required.

The utilization of beryllium compounds in the realm of rocket fuel should alleviate specific impulse requirements, since *it contains more energy per unit of volume than any other element.* However, relative scarcity and long lasting toxicity of the combustion products may prevent full utilization of the energy potentially available.

Additional military applications of beryllium will, of course, be directed to parts requiring the specific properties of the metal. For instance: because of its high heat tolerance and excellent thermal conductivity, beryllium is a likely candidate for aircraft brake assemblies. It is also being considered for use in precision instruments, such as gyroscopes, which require a material of great stiffness and dimensional stability throughout a wide temperature gradient.

● PROBLEMS

Some of these have been mentioned but before full advantage can be taken of this metal, the problems of producing it from ore through the mill must be resolved.

An efficient concentration technique must be developed. With an improvement in concentration and extraction techniques, the present price (more than $70/lb) of beryllium should be reduced to perhaps $30/lb.

To date no significant breakthrough has been achieved, although a shortened production cycle time may result from the development of a technique wherein the beryllium "pebble" can be converted directly to a billet and then directly extruded or hot formed. Work in this area is encouraging, and other methods such as cold compacting and slip casting are being explored.

Also, the possibility of direct reduction of the pebbles to powder and then rolled into sheets appears encouraging. It is believed that Russia has achieved improved properties in beryllium sheet by a method of this sort. By this method the control of grain size is relatively simple although other processing variables,

such as containing the powder and temperature control, present obstacles.

In the beryllium sheet rolling program sponsored by the Air Force, one of the major problems encountered has been that of triaxial ductility. Processing variations have allowed improvement to be made in transverse and longitudinal ductility, but ductility perpendicular to the plane of rolling is slow.

Recently, casting, extruding and forging studies have been initiated, also under Air Force sponsorship, and preliminary results are encouraging.

Toxicity is another problem requiring care, but no cause for panic. The general public first became acquainted with beryllium as an ingredient in the phosphors that gave old fluorescent lamp tubes their glow. It was the application of beryllium, *now no longer used*, that first exposed industrial workers and the general public to the hazard of berylliosis.

Today, beryllium poisoning is recognized as a general disease as is silicosis. Can it be controlled? Is it possible to work with beryllium compounds safely? Yes. The problem lies in good industrial housekeeping, which means keeping the levels of beryllium low by proper air conditioning and/or evacuation of beryllium residue from processing machinery and equipment. Safe working conditions must be provided for workers, and the general public must not be exposed to the fumes. In the meantime, further investigations are being conducted to develop the most efficient controls and to determine safe practices. In this area the Air Force has a contract with the University of Cincinnati Kettering Laboratory for the development of specific safeguards for the industrial processing of this metal.

Similar to preceding wonder metals, such as titanium, beryllium has its problems, but they are not insurmountable. Through the cooperative effort of government and industry, the "state of the art" should soon rise to the point where beryllium metal can be obtained in common mill shapes on a production basis, for limited applications at first.

Commercial applications of beryllium will be on a very limited scale for at least ten years. A broad statement indeed, nevertheless, the facts available substantiate it. The cost of beryllium will be prohibitive for awhile except in those instances where its properties are at a premium. In addition, the toxicity factor, requiring special processing equipment, increases operating costs and limits its use to specialized applications where its properties are the only answer. *Even aluminum, though, was once a laboratory curiosity.*

end

It may appear that there is little here for you — as yet — with this metal. However, for those of you who are concerned with a continuing need for an ever lighter material (and this is 1/3 lighter than aluminum), and at the same time more and more strength (and this is "6.3 times stronger than steel"), we suggest you consider, and keep an eye on, beryllium. — *W. E. H.*

Manufacturing Groups Elect New Officers

Three leading manufacturing groups—the National Machine Tool Builders' Association, the National Tool & Die Manufacturers' Association, and the Pressed Metal Institute—elected officers at recent annual meetings.

Kraut

Mattison

New president of the machine tool builders is Ralph J. Kraut, president of Giddings & Lewis Machine Tool Co. Elected with him at last month's meeting in Virginia were Alan C. Mattison, first vice president, and Everett M. Hicks, second vice president. Mattison is president of Mattison Machine Works and Hicks, vice president and general manager of Grinding Machine Division, Norton Company. Graham E. Marx, vice president and general manager of The G. A. Gray Co., was re-elected treasurer, and Walter K. Bailey, president of The Warner & Swasey Company, re-elected secretary.

New directors are Hicks; James K. Fulks, Ex-Cell-O Corporation; and Grayson M. Stickell, Landis Machine Company. Ludlow King was re-elected vice president of the association.

At the meeting of the National Tool & Die Manufacturers' Association last month in Philadelphia, the following officers were elected: Jack Kleinoder, Volkert Stampings, Inc., president of NTDMA; John A. Barth, The Barth Corporation, first vice president; Harold G. Murdock, Arrowsmith Tool & Die Corporation, re-elected second vice president; John D. Dewhurst, Arrow Tool Company, secretary and James A. Purdy, Atlantic Manufacturing Company, treasurer. George Eaton continues as executive vice president of the group.

At their annual meeting earlier this Fall, these PMI officers were elected: Carter C. Higgins, Worcester Pressed Steel Company, president; F. F. Rimmler, Volkert Stampings, Inc., first vice president; M. A. Sherwood, Grand Haven Stamped Products Company, second vice president; and Melvin Lorentz, HPL Manufacturing Company, secretary-treasurer. Unanimously elected to the newly-created position of honorary national secretary treasurer was W. Bryant Gemmill, American Stamping Company.

Coming Soon:

Here's How to Build an Anti-Vibration Foundation for a Precision Grinder
Gage Control Program Helps Maintain AQP (A Quality Product)
First-Hand Account on Europe's Machine Tool Industries

Simplified Scientific Way to

REDUCE INVENTORIES AND CUT BACK-ORDERS

by Bertrand L. Hansen
Director of Research
NATIONAL INSTITUTE OF MANAGEMENT
Cleveland, Ohio

IN THE PAST TEN YEARS we have witnessed a bounteous market for sale of products. I have all too often heard remarks to the effect that the entrepreneur doesn't have to worry about cost-saving methods because he is showing a profit every year! The honeymoon is over and now it behooves these same entrepreneurs to look more closely at their costs of operation.

One particularly fertile area for cost reduction is inventory levels. During the past few months we have seen many top company officials emphasize turnover, which of course means a reduction in inventory levels. This is a seat-of-the-pants solution to an economic problem which besets all who manufacture or purvey products. Such decisions make good sense in these times provided the reduction in overall inventory level is a result of scientific appraisal of possible reductions of each item of the total line of products. A simple illustration will serve to explain this philosophy:

Average turnover ratio is equal to

$$\frac{\text{Total yearly sales of all items at cost}}{\text{Total yearly average inventory of all items at cost}}$$

For a business whose yearly sales at cost total $20,000,000, an average turnover ratio of 4 would mean that the at-cost value of total average inventory would be $5,000,000. An increase of this turnover ratio to 8 would result in a reduction of average inventory to $2,500,000 — a release of $2,500,000 annually for investment in fixed assets, new products, or whatever appears to offer the greatest return on investment during this period. A straight-down-the-line reduction item-by-item is hardly a feasible solution, however, since some of the commodity groups in the product line may have just as good a usage rate during recessions as in boom periods. If so, it makes good sense to keep your money invested in these products provided it is an economic invest-

TABLE I

PRODUCT	ORDER QUANTITY	YEARLY SALES AT COST	AVERAGE WORKING INVENTORY	PROTECTIVE STOCK	AVERAGE WORKING INV. PLUS SAFETY STOCK	TOTAL TURNOVER
A	$60,000	$360,000	$30,000	$30,000	$60,000	6
B	2,000	2,000	1,000	200	1,200	1.67
C	15,000	30,000	7,500	2,000	9,500	3.16
D	12,000	28,000	6,500	2,000	8,500	3.3
↓	↓	↓	↓	↓	↓	↓
Total all Products		20,000,000 Total Yearly Sales at Cost			5,000,000	4

STOCKOUT PROBABILITY TABLE

CLASSIFICATION	ECONOMIC ORDER QUANTITY AS NUMBER OF MONTHS SUPPLY												
	1/2	1	2	3	4	5	6	7	8	9	10	11	12
	Acceptable Percentage of Stockouts												
Critical													
1 per 20 yrs	0.2	0.4	0.8	1.25	1.7	2.1	2.5	3	3.3	3.75	4.2	4.6	5
1 per 10 yrs	0.4	0.8	1.7	2.5	3.3	4.2	5	6	6.7	7.5	8.4	9.2	10
Major													
1 per 5 yrs	0.8	1.6	3.4	5	6.6	8.4	10	12	13.5	15	17	18.5	20
1 per 4 yrs	1	2	4	6.25	8.5	10.5	12.5	15	16.5	18.5	21	23	25
1 per 2 yrs	2	4	8	12.5	17	21	25	30	33	37	42	46	50
Minor													
1 per yr	4	8	17	25	33	42	50	50	50	50	50	50	50

TABLE 2

ment. Thus, in a planned inventory reduction, some of the item turnovers may be tripled or quadrupled while other items may remain at substantially the same ratio. The net effect of this will be an economic reduction of inventories which still meets with management's desires.

As an illustration of this philosophy, Table 1 shows a fraction of the total inventory-sales picture of a typical firm. Product A, for example, has a yearly cost of sales of $360,000. It is customary for the firm to order $60,000 worth into stock at one time (one production run). This amounts to a 2-month order quantity:

$$\frac{\$360{,}000}{\$60{,}000} = 6 \text{ orders per year.}$$

$$\frac{12 \text{ mos per year}}{6 \text{ orders per year}} = 2\text{-month supply per order.}$$

It is also a policy of the firm to carry a 1-month supply ($30,000) of product A for protection against more than expected demand during the replenishment period (lead time). In an inventory where issues are essentially linear (as they will be for most items) the average working inventory will be ½ of the order quantity. Working inventory is defined to be that part of the inventory that is constantly active. Protective inventory, on the other hand, is that part of the inventory which we know will be in the long run excessive to our needs but which we are willing to pay for as protection against demand in excess of that expected. For product A, average working inventory = ½ of $60,000 = $30,000. This $30,000 plus the $30,000 protective inventory yields a total average inventory of $60,000. $360,000 yearly sales at cost, divided by $60,000 total average inventory yields 6 turns per year. Or, the inventory is ⅙ or 17% of yearly cost of sales.

Forecast analysis shows items C & D in Table 1 are products which appear to have a projected demand pattern which will approximate or exceed the more than satisfactory current sales. The purchase or production of these two plus other similar items not shown in the example should remain substantially the same. Demand for items A and B is diminishing appreciably. This means that it is uneconomical to carry great quantities of these and other like items. A logical reduction in the order quantities of items A and B and like items, plus reduction in the safety stocks of many of the items, will achieve an increase in overall turnover ratio in line with management's desires.

The Cost of Carrying Inventory

A common formula for the Economic Order Quantity (notation may differ) is

$$N_m = \sqrt{\frac{24 \times P}{I M}}$$

where:

N_m = Number of months supply to order in one production run.
P = Procurement (setup) cost.
M = Monthly usage at cost.
I = Carrying Cost.

It is my opinion that one of the really significant factors contributing to the turtle-like adoption of scientific management techniques by industry is the square root formula. The radical sign seems to automatically produce a mental block and negative attitude. Furthermore, we of the mathematics and statistics fraternity do little to help our cause by persisting to communicate with each other in language (symbols, notation, etc.) which only we can understand readily. Often times an easy-to-use nomograph for finding the proper Economic Order Quantity will accomplish more than all the spuriously accurate formulas available. A nomograph of this type has been developed by the National Institute of Management for solution of the above formula.

A logical economic method for reducing working inventory is to state algebraically that it costs more to carry inventory. A carrying cost is a combination of the various costs of possessing inventory, such as value of money invested in inventory (often called interest), taxes, insurance, storage, deterioration, obsolescence, etc. One of the largest and most variable of these costs is the money invested in inventory.

One method is to assess this cost at 6% — what you will pay if you borrow money. Another method is to value this cost at the rate of return you could expect to get if you invested the money elsewhere. This could run anywhere from 10-50% and higher. It seems only logical that in tight times when money is hard to get the return-on-investment

figure should be used. When times are good and you can borrow all you want, it would be hard to justify anything higher than 6% — the cost of borrowing. The effect of this may be illustrated by the solution of two economic order quantity formulas having common procurement (setup) costs and monthly usages but which have different total carrying charges resulting from assigning two different values for the cost of money invested in inventory.

If the cost of borrowing figure of 6% is used in one formula and in the other the rate of return on investment is used, say 30%, the difference in "I" in the two formulas results in a substantial difference in average working inventory and a changed turnover ratio.

Another particularly fruitful means of reducing total inventories is the setting of protective safety stocks in order to avoid out-of-stock (back-order) situations. Since we cannot predict exactly the length of the replenishment period (lead time) and the usage during the replenishment period, we must protect adequately against variability. The 3 variables which necessitate the carrying of excess stock for protection are: length of the replenishment period; number of demands for the item; and size of the demands.

A common but unscientific method used is to set the protective stock at some stated supply (a month's supply, for example) across-the-board for each item. Generally speaking, such a policy will result in stocking-out often on items where the number of demands (orders) is small, and in having excess safety stocks in the high demand items.

A more scientific method is to take usage of the item into consideration and set the protective stock at a level which takes usage probability into account. We will be concerned in the remainder of this article with the determination of protective stocks in line with acceptable stockout probabilities.

Analysis Yields Results

Variations in the length of the replenishment period and the size of demands have some influence on the incidence of stockouts, but of prime importance is the variation in the number of orders placed during the replenishment period. In an example worked on by the author there were some interesting and rather typical patterns exhibited. The example covers the activity of a plumbing item at a manufacturer's plant. It was policy to manufacture a 2-month supply at one time and to carry a 1-month supply of protective stock. There was no maximum stock level as such, but variations in usage and fairly constant order quantity caused this maximum level to fluctuate considerably. The minimum level was set at the protective stock level and regularly at the end of every other month an order was placed for a 2-month supply to be delivered into finished goods inventory at the end of the coming month.

Essential to proper analysis of the item activity was the calculation of average monthly usage, average number of demands per month, and the average size of a demand.

Substitution of the appropriate values and calculation of the Economic Order Quantity formula previously cited yielded an order quantity of 2.24 months supply. Since a mathematical formula is, even at best, only a valuable tool to aid in making decisions, there is no sound reason for changing the 2-month order quantity to agree with the formula. It does, however, assure us that a 2-month supply on order is just about right if we have made a proper economic analysis of procurement costs, carrying costs, and monthly usage.

It was evident that little could be done to reduce the average working inventory portion of the total average inventory but this did not appear to be true for the protective stock. It remained for analysis to determine the amount of reduction, if any, in the protective stock.

The frequency of demands per month was chosen as the variable for analysis. A mathematical formula known as the Poisson law was used to arrive at the frequency distribution of the number of demands on inventory per month. Finally, a control chart was constructed to determine 1) whether the demand pattern was a controlled pattern and 2) whether any particular month had a number of demands significantly different from the average.

After this phase of the analysis a reorder point was established with the aid of the Stockout Probability Table (Table 2) and a reorder point chart, developed by the National Institute of Management. The reorder point chart is precalculated for different probabilities and usages during the replenishment period.

Setting of a reorder point based upon these factors is a round-about way of creating protective stock. By setting a reorder point *above* the number of demands expected during the replenishment period we protect against demand beyond the average. The reorder point minus the expected usage is the protective stock.

The completed analysis resulted in a 50% reduction in protective stock and a 25% reduction in total average inventory. Converted to dollars this represented a yearly release of capital of $1200 — no mean figure for this one item alone. It does not require too much mental calculation to translate this figure into the hundreds of thousands, and even millions, that could possibly be released by a total inventory analysis.

Using The Stockout Chart

The National Institute of Management uses the stockout probability table to establish a consistent and proper stockout policy. To use it, all that is necessary is to classify your items into critical, major, and minor categories and use the stockout per years figure which you think should be used as policy. Actually the process of classification into categories of seriousness is just plain old common sense formalized. The formalization eliminates the variation we would have to expect if we let several people set protective stock policy. The following may be used as a guide:

Critical — Competitive high dollar activity items, important maintenance and replacement parts.

Major — All items neither critical nor minor.

Minor — Proprietary items and non-competitive low dollar-activity items.

To use the chart (Table 2) follow this procedure:

1. Locate the item Economic Order Quantity (EOQ) expressed as number of months supply.

2. Select proper classification (Critical, Major, Minor) expressed as one stockout per number of years.

3. The value at the intersection is the acceptable percentage of stockouts.

When the acceptable stockout percentage is determined, the reorder chart (available from the National Institute of Management) is consulted for the proper reorder point.

Each item in your inventory may be analyzed for reorder point solution in a similar manner. This provides a built-in protective stock which is the result of a consistent management policy rather than across-the-board protection. If you are not using these principles you may be sure that you are over-protected on many items and under-protected on some others. It is almost a certainty that your total average inventory is in excess of what it should be or needs to be.

DRILL IT ...with a "cool" tool

DRILLING HOLES, DEEP OR OTHERWISE, is usually best accomplished by supplying coolant to the drill point as it works. As far back as you go there are records of coolant-lubricant being brought to the workface either by flooding or by pumping through the tool. Some of these techniques are ingenious, but none have been completely satisfactory.

In modern tooling, most drills having oil holes are made by drilling two parallel holes into the end of a flat bar and then twisting the bar to form the flutes. In this instance, as the drill bores a hole, coolant-lubricant is forced to the drillpoint. It is lubricated and cooled and the chips are flushed out along the flutes. For many types of materials, especially hard or abrasive materials, this was the only solution. However even the best of these drills has inevitable inaccuracies incurred while drilling the two holes or during the twisting of the bar. These inaccuracies cause excessive drill-point wear and to offset this the drill may have to be ground back to a place where the coolant holes are equidistant from the center. This is uneconomical, and unfortunate since in mass-production more metal is removed by drilling than by any other machining method.

Mossberg Inc. of Cincinnati, tried a different approach to the ancient problem, and in cooperation with the Metallurgical Products Department of the General Electric Company, a new efficient drill was born.

The Mossberg drill — Cold Point — is basically simple, being made from standard heavy wall tubing rather than drilling and twisting bar stock. In production the two flutes are milled on a dividing head after which the drill is heat treated to 45 Rc. It is then centerless ground to ensure concentricity, and a slot is milled in the tip transverse to the axis. Into this slot a blank of cemented carbide is brazed, which is then ground to have a helix point and negative rake angles. As can be seen in Figure 1, this construction results in two holes flanking the carbide tip which open to the tubing ID.

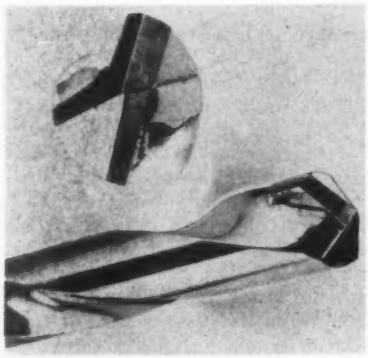


Fig. 1. Enlarged views of a 7/16" dia Cold Point drill showing the helix point and the crescent shaped oil holes.

The cemented carbide tips are Grade 883 Carboloy chosen for their unusual characteristics of strength, hardness, and wear resistance.

At present, it seems there is no limit to the size of a Cold Point drill. Mossberg is in production of sizes up to and including 1½" dia, and only expansion of present facilities remains to obtain production numbers of larger sizes. In the other direction, experimental drills have been made from hypodermic needles 1/16" in dia to prove soundness of design; at the present the smallest production-run drill is 3/16". These smaller drills are a great improvement over the standard 2-hole drill which is limited in length and to a dia of about 7/16".

Indications are that applications are practically unlimited. The most startling drilling has been in the less common materials like titanium, zirconium, and refractory materials, although not limited to these. On the contrary, this drill is proving to be cheaper and more efficient even on conventional cast iron and SAE 1010-1020 steels. Also the coolant-lubricant effectively keeps the tip below work hardening temperatures, meaning that subsequent operations like tapping and reaming are less difficult.

The ability of the drill to drill hard materials and also soft materials makes it an especially attractive tool. Plastics have been difficult to drill because standard drill temperatures climb above their melting points and their chips in amorphous masses do not flush easily. Till now, the only solution was to repeatedly back out. But Cold Point is no misnomer: the entire drill, even after the deepest cut in any material, can be withdrawn from the hole and found to be at a temperature below that of the naked hand.

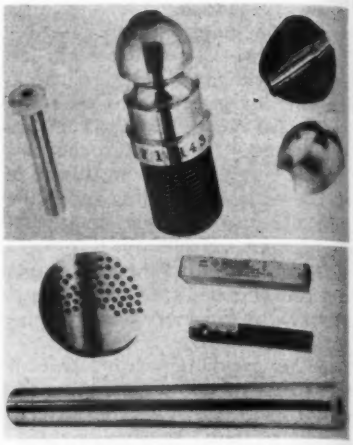


Fig. 2. The holes drilled in these parts demonstrate well the ability of a Cold Point drill. Grouped above are: an aluminum stud, a 45 Rc steel trunnion, an AISI 52100 ball bearing (broken open to show finish), a Mo-Max tool bit (drilled end-for-end), a Tantung tool bit, a 1½" dia x 13" Udimet 500 bar, and a 52 Rc steel test plate drilled continuously without drill sharpening.

Zirconium, one of the more refractory metals, has presented a rather difficult problem in deep-hole drilling. In one special application, specifications called for a hole ¼" in dia the length of the solid bar. It had heretofore been impossible to achieve an acceptable hole of less than ⅜" dia — and this took hours. A ¼" Cold Point drill went through on a production basis of 1 ipm.

All holes shown in Figure 2 were drilled with a water-soluble coolant oil, (like Cimcool S-2) on a turret lathe at its maximum speed of 1500 rpm. Other installations show that this drill can be used in any lathe, any gun drill setup or in any drill press. Only the addition of a chucking means and method for pumping the coolant are necessary. A simple Jacobs Rubber-Flex chuck, or equivalent, is sufficient. While top speed capacity of the drill is so far not questioned, no new machine is necessary to use the drill; it is logical, however, that the higher the speed the greater the rewards.

There seems to be a vast field for these drills immediately. And test results indicate a brilliant future.

— As told to William E. Hoffman

OPERATION TOOL CRIB

A complete tool control check system that saves tools and manhours for L & N.

by Raymond M. Wood
Head, Tooling Section
Industrial Engineering Division
LEEDS & NORTHRUP COMPANY
Philadelphia, Pa.

MANY PLANTS HAVE BEEN FACED with tool loan and tool crib inventory control problems. In small plants, the "brass check" system has been found adequate for tools on loan; in larger plants it doesn't work so well. Leeds & Northrup Company has replaced this system with an improved tool loan system with compatible inventory control system with good results.

The L&N brass check system involved the use of master check boards adjacent to the tool crib window. These boards held a metal pocket for each worker authorized to draw tools, and also a hook for each worker's 15 brass tool checks.

A worker borrowed a tool by presenting a tool request slip at the tool crib window. The crib attendant placed this slip in the worker's pocket on the master board and took one of the brass checks from the hook. This check was placed on a hook at the tool storage location and the tool was then turned over to the worker. A returned tool reversed the process.

Persons not assigned brass checks but who required a tool, by-passed the check board; their tool request slip was placed at the storage location in place of the brass check.

This system made it easy to count the number of tools of a certain type of service, and automatically limited to a pre-set quantity the number that any person could borrow. These advantages, however, could be gained by other more efficient methods. At L&N we especially wanted the following additional results as part of our system:

- Fuller facts about how long tools have been out on loan.
- Maximum use of tools in service; minimum tool inventory.
- Proper maintenance of tools to protect product quality.
- Avoidance of mixups due to checks accidentally being knocked off the storage location hooks.
- Promotion of safety and lessening of torn-clothing hazards caused by the check hooks.
- An easy way to collect all of the tool crib charges for an employee who changes departments or leaves the company.

Re-Vamping the Systems Saves

To attain these advantages, L&N re-vamped the tool crib system to operate as follows:

1. The tool request slips (Fig. 1) are still used, but they come in three colors which rotate monthly.

2. The brass checks and boards are no longer used.

3. Check boards still have a pocket for the requisitions of each authorized tool-borrower, but they also have additional pockets for requisitions of employee-groups whose members do not borrow tools often enough to warrant a pocket for each individual; and additional pockets for the requisitions for scarce or expensive tools, regardless of whether or not the borrower also has a pocket for his everyday needs.

To borrow a tool under this sys-

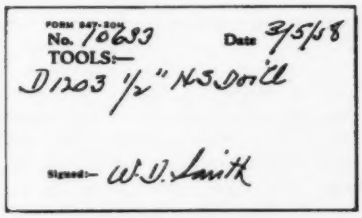


Fig. 1. Tool Request Slip

Sheet 1 Of 3
Date 4-4-58

To: I. M. Foreman
For Drilling Section

OVER DUE TOOLS PROCURED ON CHECKS

The following tools have been withdrawn for a minimum period of (1) month. These tools must be returned to the Tool Crib by 4-25-58. All tools not returned by the above date will be charged to your departmental Small Tool account.
Your cooperation in having these tools returned, or charged out permanently, will be greatly appreciated.

CLOCK NO.	DESCRIPTION	DATE RETURNED	TOOL CRIB CODE NO.	COST
11051	3/8 "chucking reamer	4-14-58		
11051	15/32 "tapered shank drill	4-14-58		
11051	23/64" H.S.S. straight shank	4-14-58		
11051	1/2-20 Gun tap.	4-14-58		
11059	15/16 "Gairing Counter bore		C-1296	$5.99
11059	A-Z Gairing C.B. Holder		H-252	$6.09
11063	3/8 "pilot for C.B.	4-16-58		
11063	1 "Gairing Counter bore	4-16-58		
11063	A-Z Gairing C.B. Holder	4-16-58		
11066	3/8 "Carbide drill	4-11-58		
11071	1/4" H.S.S. straight shank	4-15-58		
11071	1/2 "Countersink		C-1588	$3.57
11075	2 "dia. Hole saw	4-11-58		
11075	17/64 "drill	4-11-58		
11075	#20 drill	4-11-58		
11075	10-32 Gun tap	4-11-58		

Fig. 2. Over Due Tool Tabulation Sheet

tem, a worker hands in a request slip (Fig. 1), just as he did under the brass check system. The tool crib staff makes sure he is supplied with the right color slips for the month. They then get the requested tool and put the slip in the proper pocket on the check board. When the worker returns the tool, the slip is returned to him; the tool is inspected and reconditioned if necessary, and then returned to stock.

This system, with its use of different colored slips for different months, limits the time a worker can keep a tool. When the color is changed for the third month, slips that were issued for tools during the first month are removed from the board and tabulated by the window attendant. A copy of this (Fig. 2) is sent to the foremen or supervisors of the persons still holding tools borrowed during that first month. Tools not returned within the specified period are charged against the foreman's small tool budget account and replacements are put into service.

This method of providing for frequent turnover of tools has cut L&N inventories by varying amounts, depending on the type of tool. The cuts are much larger, however, than would be needed to justify the new system.

By preparing carefully, the system started smoothly. We first talked the plan through in detail with all tool section people. Then we had question-and-answer sessions with foremen and other supervisory people involved. They passed the information on to their own people. That was two years ago, and since then L&N management feels the system has been fully satisfactory at all times.

Good Housekeeping Saves

Like many jobbing shops, we formerly issued all the tools needed for a production batch at one time. For a part which required milling, drilling, tapping, and threading, for instance, we would put all the cutters, jigs, drills, taps, and so forth, in a tote box and forward them to the first production operation. The box would move with the job, and when the production lot was finished, the box and its remaining contents would come back to the tool crib. Tools would vanish along the line, however, especially if the job was held up somewhere, as so often happens in any job-shop work. And, even if all the tools came home to roost, they would have to be out for a long time, so the tool inventory would have to be high.

This situation has been corrected simply by issuing the tools for production layouts one step at a time. When the tools for one step are returned, those for the next go out. Like good housekeepers, we count the silver the minute the party is over, and if any has gone into the garbage we get it back fast. With this method, tool turnover is so high that we have cut inventory of expendables like small drills by as much as 90%.

Tooling-Purchasing Liason

Because we carry in stock between 10,000 and 12,000 different tools, we could have quite an inventory control problem. Our fairly simple paper-work system, however, meets our needs and seems sufficiently flexible to meet the needs of others. It revolves around the use of a "code number" which is used throughout the cycle of operations.

These code numbers are assigned in blocks of numbers for each type of item stocked. A block of numbers from D-1001 to D-1250 is used for fractional size twist drills, for instance. The estimated maximum number of items to be stocked determines the size of the block.

This method of identification makes it easy for any person, regardless of experience, to correctly identify the proper tools in processing requisitions and purchase requests. The patented Visi Record form (Fig. 3) is filled out as the Tool Section's record of the stock of Code No. D-1203 ½" high speed drills. Immediately below the general description of the tools, at the top of the card, is a file designation, a charge number for Purchasing, a unit cost figure by Purchasing, a minimum stock (12 in this case), and an amount to order (24 in this case). In the upper left-hand corner are spaces on which purchase orders to the supplier are entered, the last order being 24.

In the lower left-hand corner are spaces for drills received on these purchase orders. The latest entry shows that the 24 drills ordered on February 15 were received on Feb-

ruary 26. The remaining three columns on the card are marked "stock." For an explanation of these entries see Figure 4, Tool Crib Requisition. These forms are used by workers in withdrawing tools. This particular requisition has Code No. D-1203 on it, the charge number, the worker's clock number, the approval signature of his foreman, description of the tool, and the quantity required (19). Looking back to the fourth line on the stock column of the Visi Record card (Fig. 3), 27 of these tools were in stock on February 14. The next entry on February 15 shows eight left. This is because the 19 tools had been withdrawn. The final entry on the Visi Record card shows on February 26 there were 32 tools in stock, representing the addition of the 24 already referred to as purchased.

Now, when these 24 additional drills are put into stock, the tool crib attendant fills out the form shown in Figure 5, which shows again the code number of the tool and the date, the quantity of tools received, and the quantity present in total stock—the actual count. The form goes back to the Tool Section office and the "present total in stock" on this card is compared with the quantity shown by the Visi Record card to be in stock. Since the two quantities match, the inventory is correct. This simple check is the basis of perpetual inventory information.

The final form used in this work (Fig. 6) is maintained by the Purchasing Department. It carries the code designation D-1203, in this case, for ½" HSS twist drills. It has spaces for entering the date ordered, order number or supplier, purchase order number, amount ordered, amount received, date finished, unit cost, and total cost. Looking at the card, the last entry is for the 24 drills already referred to.

We are often asked why Figures 3 and 6 are not duplicates of the same card. The answer is that Figure 3, being used for tool crib inventory control, requires more frequent reference to the file for posting stock activity than is required by Purchasing's Figure 6, which is used only at the time of re-ordering.

This relatively simple system provides automatic cross-check for errors, keeps L&N's information up-to-date, and has saved between 250 and 275 manhours formerly required for annual physical inventory.

end

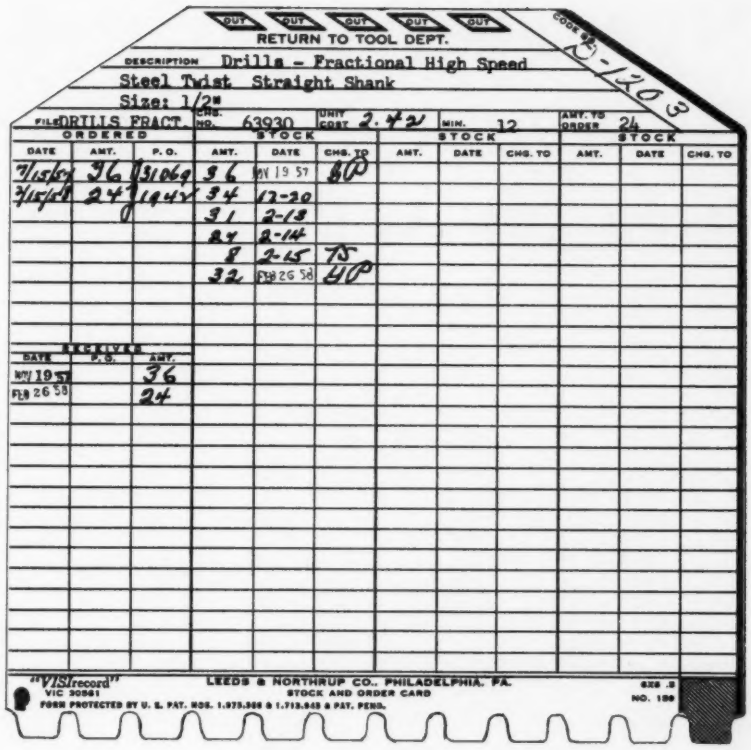


Fig. 3. Visi Record of Tool Crib Stock

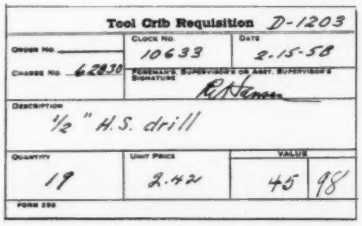


Fig. 4. Tool Crib Requisition Slip

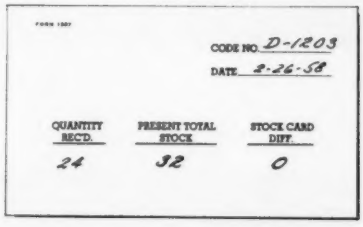


Fig. 5. Tool Stock Addition Slip

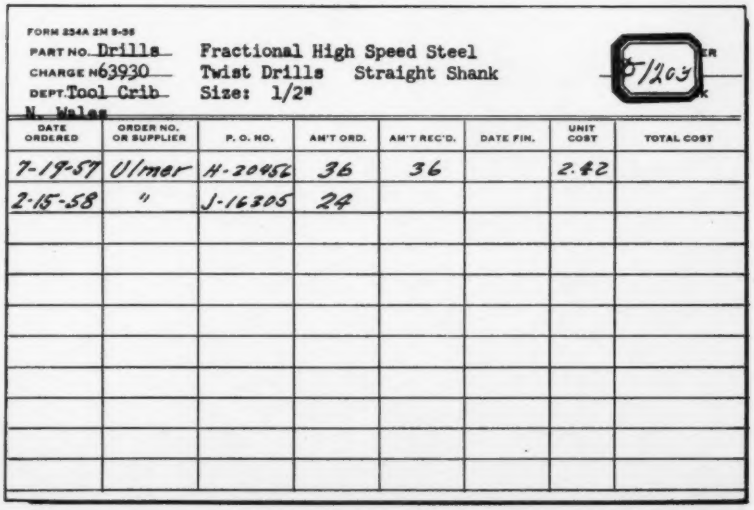


Fig. 6. Purchasing's Order Record Card

NEW FIXTURING AND HANDLING EQUIPMENT IMPROVE WELDING OPERATIONS

by R. C. Andrews
Plant Manager
Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek, Michigan

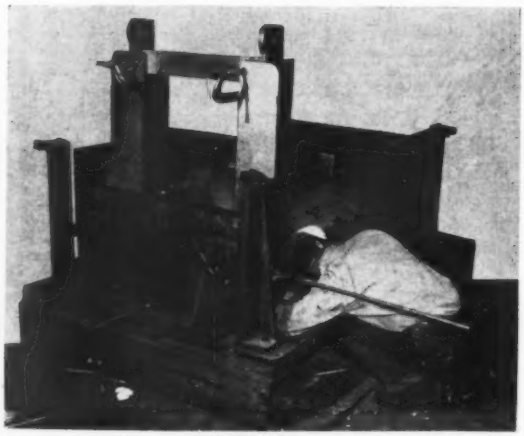


FIGURE 1.

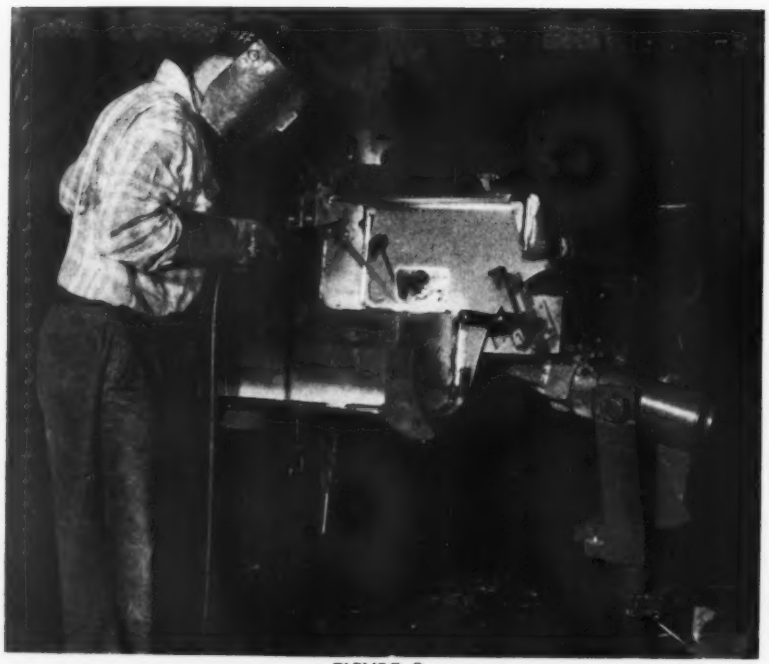


FIGURE 2.

WELDING FIXTURES HAVE BEEN USED for a long time by the Industrial Truck Division of Clark Equipment Company, but recent innovations in their setup has greatly improved their production operations.

New fixturing, improved handling equipment, development of sub-assemblies, standardization of parts, and extensive use of iron powder electrodes with Lincoln Electric's AC Idealarc welders have increased welding speed and improved weld-appearance.

The old way of welding truck frames included extensive use of heavy fixtures with C-clamps to hold parts in place as illustrated in Figure 1. Operators frequently had difficulty getting in tight places to complete their welding. Even when the fixtures were used for tacking, the frames themselves were so large that positioning was time-consuming.

The new way of welding truck frames is to make a group of sub-assemblies in a neat positioner-mounted fixture as shown in Figure 2. With this arrangement the part is small enough to be easily handled, is quickly clamped in the fixture, can be positioned so that all welds are suitable for down-hand

welding with large electrodes, and has all joints readily accessible to the welder.

A battery-powered magnetic lifting clamp is one of the new types of handling equipment that saves time. This device, shown in Figure 3, eliminates slings and clamps when lifting parts and assemblies. The fixture also uses quick-acting hold-down clamps. Positioned at a convenient height for the welder, it positively aligns and firmly holds the work and is easily loaded and unloaded.

At the final assembly station, Figure 4, welders put together all the sub-assemblies in the truck frame. The sub-assemblies arrive at the station on roller conveyors. This fixture rotates for positioning. Although it is more complicated than those for sub-assemblies, it provides equal access to the joints and is quickly loaded and unloaded. An added advantage of the sub-assemblies is that special orders can be made up principally with standard parts by substituting a few special sub-assemblies where needed.

end

FIGURE 3.

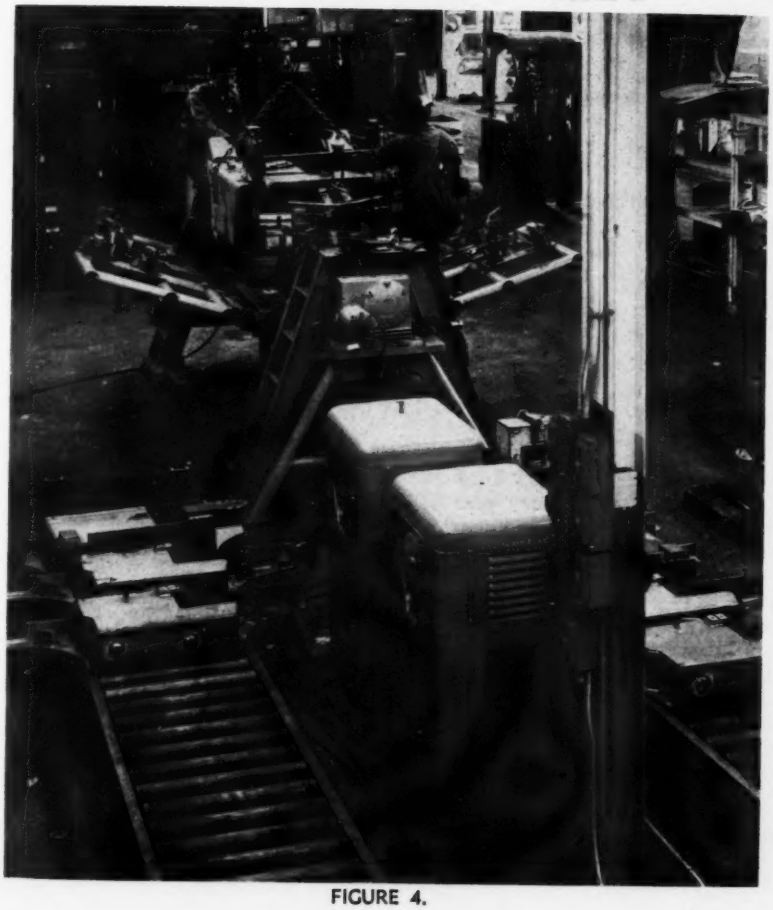
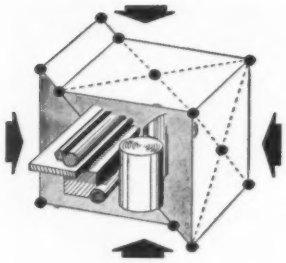


FIGURE 4.



PROFILE-ROLLING for economy, finish, strength and uniformity

by Donald McNary
and
Kempton A. Whiting
General Plate Division
METALS & CONTROLS CORPORATION
Attleboro, Massachusetts

Again and again we find ourselves suggesting forming, wherever possible, rather than machining. The why of it all is answered by the word—economy.

WE HASTEN TO SAY, however, that economy, although it seems to be the most apropos word we can use here, is not the only advantage of fabrication by these processes. There can be little argument that where a forming process is available, and feasible, the part desired will be optimum in many ways.

Profile rolling, for instance, offers many advantages. And it's not a new process. The cold rolling of shapes probably began in the brass and copper industries long ago and then spread to silversmithing. More recently the process has developed through the use of better steel for rolls, and better designed, more efficient rolling mills. Development now is to a point where its use is only limited by the cold working properties of the materials involved, or the part size in relation to available equipment. In some cases, the practicality of rolling a particular shape enters as a deterrent. But in most cases this process is applicable where the material will cold roll under pressure.

In general, the value of the profile-rolling process can bring about one or more of the following: a reduction of scrap, hence lower material costs; greater strength due to grain orientation; availability of shapes which cannot be machined by conventional methods; elimination of intermediate production operations with the resultant lowering of fabrication costs (including labor both direct and indirect); and faster production.

Perhaps the two greatest advantages of profile rolling, over and above those mentioned above, are the possibilities of close tolerances and excellent finish. However, even though profile-rolled parts take to close tolerances, the tolerance is a factor which will affect costs. In most instances, the closer the tolerance, the higher the cost.

The following are some specific examples of profile-rolled shapes which will better illustrate the advantages and limitations of profile rolling as compared to the alternate processes of hot rolling (then machining), casting (then machining), extrusions, etc.

It will be helpful at this time to examine a specific example of improved tolerance. One particular part is made from a difficult-to-work material in 1.5″ widths. The width tolerance was held to ±0.030″ with hot rolling and approximately the same for the extrusion process. With cold rolling, the width tolerance was held to ±0.006″. Whereas hot rolling or extrusion might have been less expensive than cold rolling, these processes had other limitations in addition to loose tolerances. One such limitation was finish. Parts made by processes other than cold rolling tended to be rough (63 rms),

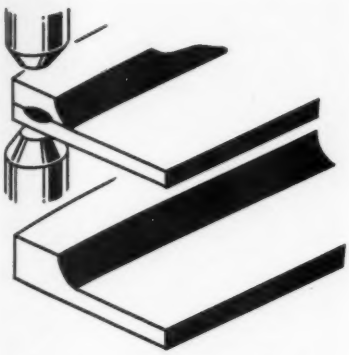


Fig. 1. Shown here are two illustrations in one. The lower is a jet engine ring as it is made today, by profile-cold-rolling. At the top is seen two pieces being welded for the make up of the part, as it was previously fabricated.

whereas the profile-rolled parts had a finish of 20 rms.

In addition, profile rolling often allows the elimination of intermediate production steps. Figure 1 shows a part with a cross section similar to that of a jet engine ring. The

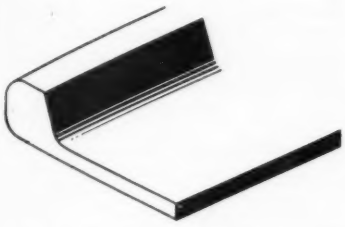


Fig. 2. Shows a part which is now being cold rolled. Previously the shape was milled at a much higher cost than that being experienced with rolling.

top sketch indicates how the ring was made before the profile-rolling techniques were applied, where pieces of flat stock were welded together. The bottom sketch shows the same piece as profile-rolled without the welding operation and of course without the seam.

Figure 2, an example of scrap reduction with cold working, shows a constant-section profile-rolled shape which is also a jet engine part. Before this part was cold rolled, as a means of fabrication, a special fixture had to be made to hold a length of stock in place in the milling machine. The stock had to be cut to length according to the machine capacity, and 63% scrap (based on starting weights) was created, not considering end-scrap. Machining costs varied with the efficiency of the machine tool used. This part was made from titanium. It is, admittedly, an extreme example since raw material costing $10 to $15 per pound was used; but then the no-scrap feature makes the use of this process almost a "must." Before cold rolling the cost of raw material was 2½ times greater due to scrap. In fabricating this shape by this method, a standard round or rectangular bar stock could be used with no resultant scrap.

The elimination of cutting, scrap, and all machining allows the finished price of the part to be close to the cost of the raw material alone when the part was machined.

Certain brass shapes, Figure 3, which could not be machined ac- for Elox electrodes. This shape is an example of a part made practical because of profile rolling.

The best known profile-rolled shape is the compressor vane strip, seen in Figure 4; it is used in the compressor section of jet engines for blades. Greater accuracy is attained here from cold working than was possible with machining. This profile-rolled shape is also stronger

Fig. 3. Here is an electrode shape used on an Elox machine. This tool is disposable and must be produced in quantity for production use.

since its grain structure follows the contour of the piece. Vane strip is produced from many different types of metal including Type 410 Stainless Steel, brass, aluminum, commercially pure titanium, and others. The exacting standards of the aircraft industry's air foils can be met in this way with excellent finishes (16 rms).

Applications of profile rolled shapes are by no means limited to the aircraft industry. Hinge wire is a good example of non-aircraft application. Hinge wire is used on all eyeglasses and is usually a profile-rolled shape (see Figure 5). An alternate process for manufacturing hinge wire is the slower and more costly blank-and-strike process. Still another method is to draw the wire through draw benches. This is an expensive slow procedure which requires hand straightening in addition. Considerable improvements have been developed in the cold rolling of hinge wire which have broadened even more the production-cost gap between drawing and rolling. The extrusion of this wire is *less* expensive than rolling (even with the die wear problem) but this method has the drawback of poor finish. Non-uniform size is also to be dealt with. Close tolerances (±0.001") and better finishes can be had, 6 to 7 times quicker, by profile rolling than with alternate methods.

A final example of economy and improved construction involves a rolled strip having a cross section configuration necessary for a hy-

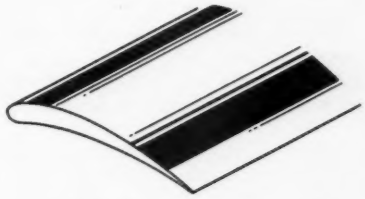


Fig. 4. Airfoil blade shapes are rolled from many materials, with exceptional savings and improvements in end products.

draulic valve. The manufacturer of aircraft components has found that a piece that had cost $7.50 to make can now be produced by the cold-rolling method for about $0.20. Milling intricacies of the necessary shape (Figure 6) had kept the price of these parts high.

All three methods (cold rolling, hot rolling and extrusion) offer the best results when radii are used for surface transitions. However pro-

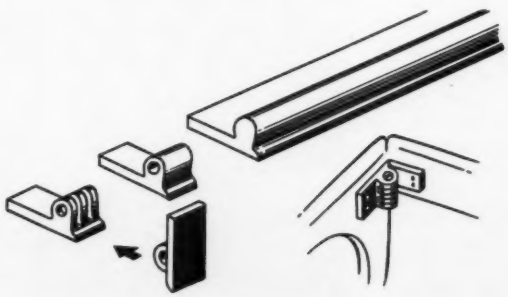


Fig. 5. There are many "little thought of" shapes around us in our everyday life. Here is one: the hinge on our glasses. These parts can be made in other ways, but none offer the finish, price, and uniformity advantages that profile rolling does.

Fig. 6. Another example of a profile-cold-rolled part which represents a manufacturing cost of only 2 to 3% of the original cost of the machined part.

file cold-rolling can be done with a 0.010" minimum radius and the other methods dictated a 0.062" minimum radius. None of these three methods are suitable to furnish bent constant thickness strip stock—this must invariably be done on roll forming machines.

Tooling costs for cold rolling run about $500 to $3000 depending upon the shape to be rolled.

Further, strength and workability characteristics of parts profile rolled are generally superior to parts made by other procedures. Here again the workability is superior due to grain refinement. It should also be of interest to know that cold rolling does not hinder workability control to be brought about through heat treatment.

To summarize: Cold rolling may profitably be considered where difficult-to-work materials, close tolerances, high surface finish, sharp corners, thin sections, complex radii or intricate angles are involved. Manufacturers concerned with profile-shaped parts now machined from bar or assembled from two or more pieces, may find significant advantage in profile rolling.

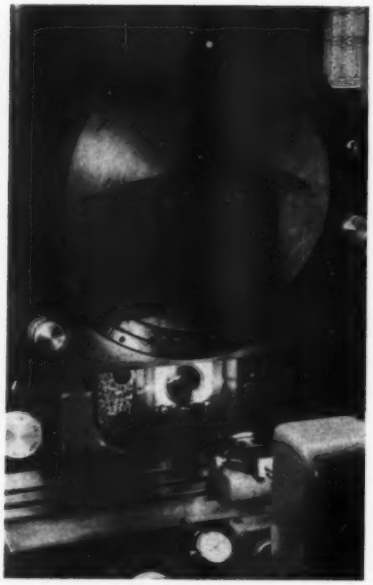


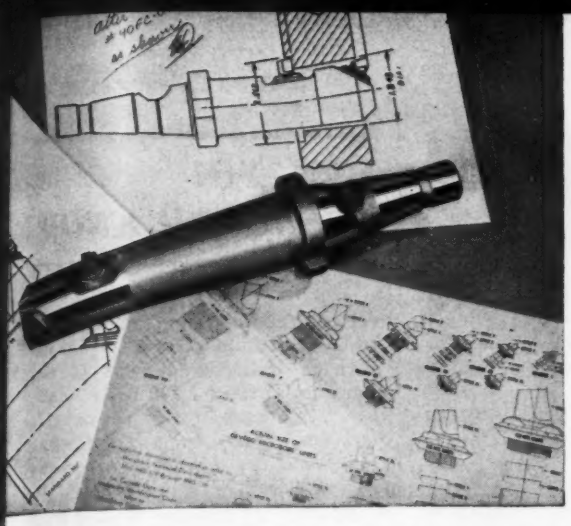
Fig. 7. A shadow comparator used to perform precision inspection of a profile rolled shape at the General Plate Division, Metals & Controls Corporation is shown here. The part being inspected has a compressor vane cross-section.

Fig. 8. This photo shows a close-up of the profile rolling rolls in action. The stock being rolled is titanium, similar to Figure 2.

Twenty-Four Hot Ones

When welding 3" thick chrom-moly steel center hubs plus radial members or vanes to twenty-four 60" dia chrome-moly steel gas turbine cylinders, R. C. Mahon Co.'s operator found he had tackled a job almost surrounded in a "ring of fire."

Each of the 4850-lb cylinders (with 3" sidewalls) was mounted on a rotating table in an almost horizontal position. Since the work required preheating, and the heat maintained constantly at 450°F during welding to avoid stress cracks, it was almost surrounded by flames as shown. Piping was arranged for a mixture of natural gas and air, and sheet metal hoods helped retain the heat as welding progressed. Rods used were of the 90-16 low hydrogen class. After welding, work was stress relieved, then final machined, with warpage and shrinkage controlled to within 1/16" limits.



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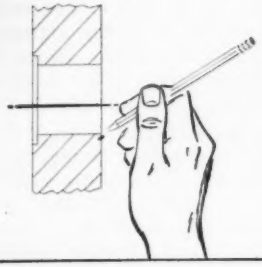
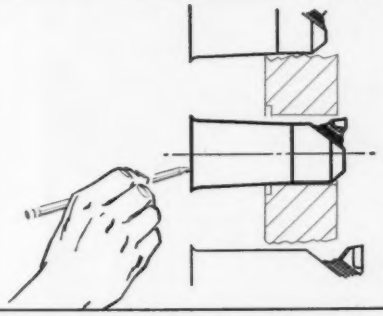
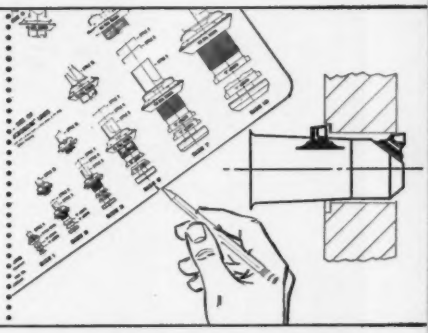


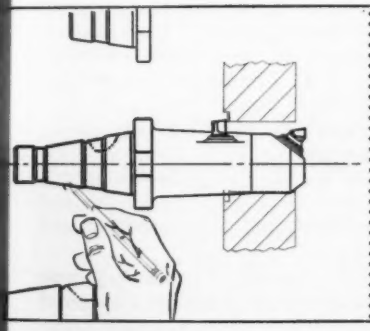
1 Make a full scale layout of bore to be produced, on tracing paper.



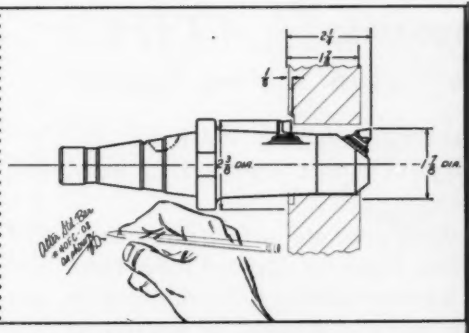
2 Place layout over standard bar nose templates. Select and trace the most suitable bar nose.



3 Select suitable Microbore Unit from template and trace in position for added tool station.



4 Trace the desired shank on boring bar, using shank template.



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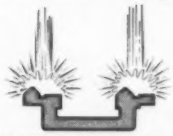

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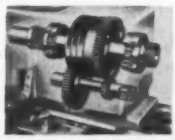

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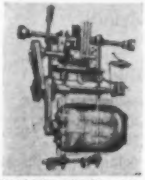

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MEN YOU SHOULD KNOW

Firth Sterling Inc. announces the recent appointment of **W. W. Wellborn** as technical director of the Carbide Division. Formerly manager of new products research, he is now responsible for process metallurgy and the metallurgical aspects of quality control.

Edward C. Lindsay is now vice president in charge of manufacturing for The Hufford Corp., a Division of The Siegler Corp. **Dan W. Burns** and **Robert T. Campion** have also been elected vice presidents.

Appointment of **B. L. Hengesbaugh** as supervisor of quality engineering, Main Assembly Plant, Dodge Division, Chrysler Corp., has been made known by the company.

New president of Nu-Matic Grinders, Inc., is **Arthur Raske, Jr.,** former executive vice president.

Taking over as manager of the Machine Tool Division of Clearing Machine Corp., Division of U. S. Industries, Inc., is **Paul N. Stanton.**

Promotions at Cutler - Hammer, Inc. include **E. S. Mathiesen,** works manager; **G. W. Bolln,** manager of operations planning; **C. J. Steinke,** manager of operations production; and **E. H. Comstock,** superintendent of the 30th Street Plant.

Felix W. Braendel was elected president of the Groov-Pin Corp., with **Mrs. E. F. Schniewind** serving as vice president and secretary, and **F. O. Becker,** vice president and treasurer.

Advancement of **Joseph N. Kemple** to the position of general manager of Page Steel & Wire Division, American Chain & Cable Co., Inc., was recently announced by the company.

J. M. Norris has been named factory manager of Marquardt Aircraft Co.'s ramjet manufacturing facility in Ogden, Utah.

New director of Swift Engineering Co., Inc., and vice president in charge of Production Equipment and Die Design Division, is **Edward J. Henkel.**

Appointment of **August Nuut** as principal engineer, transistor circuitry, was recently announced by Consolidated Electrodynamics Corp.

Huck Mfg. Co. makes known the appointment of **W. S. Hyler** as technical assistant to the vice president of research.

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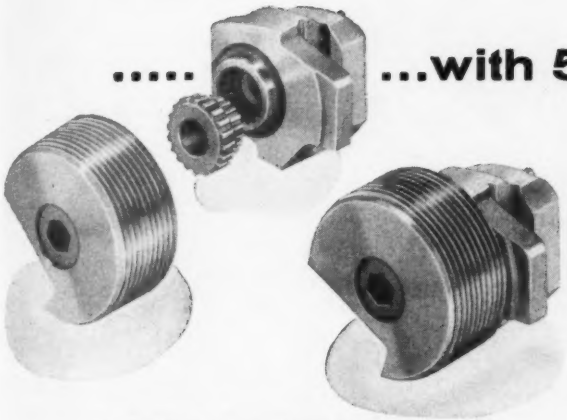

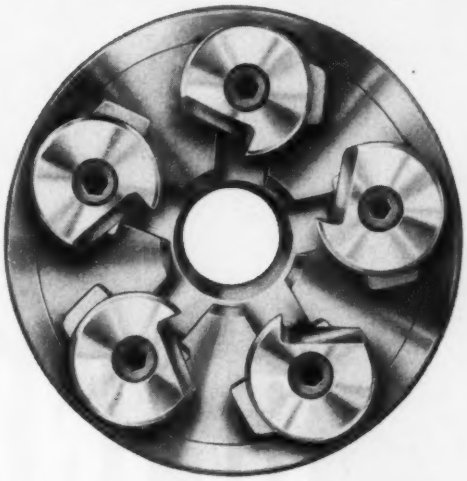

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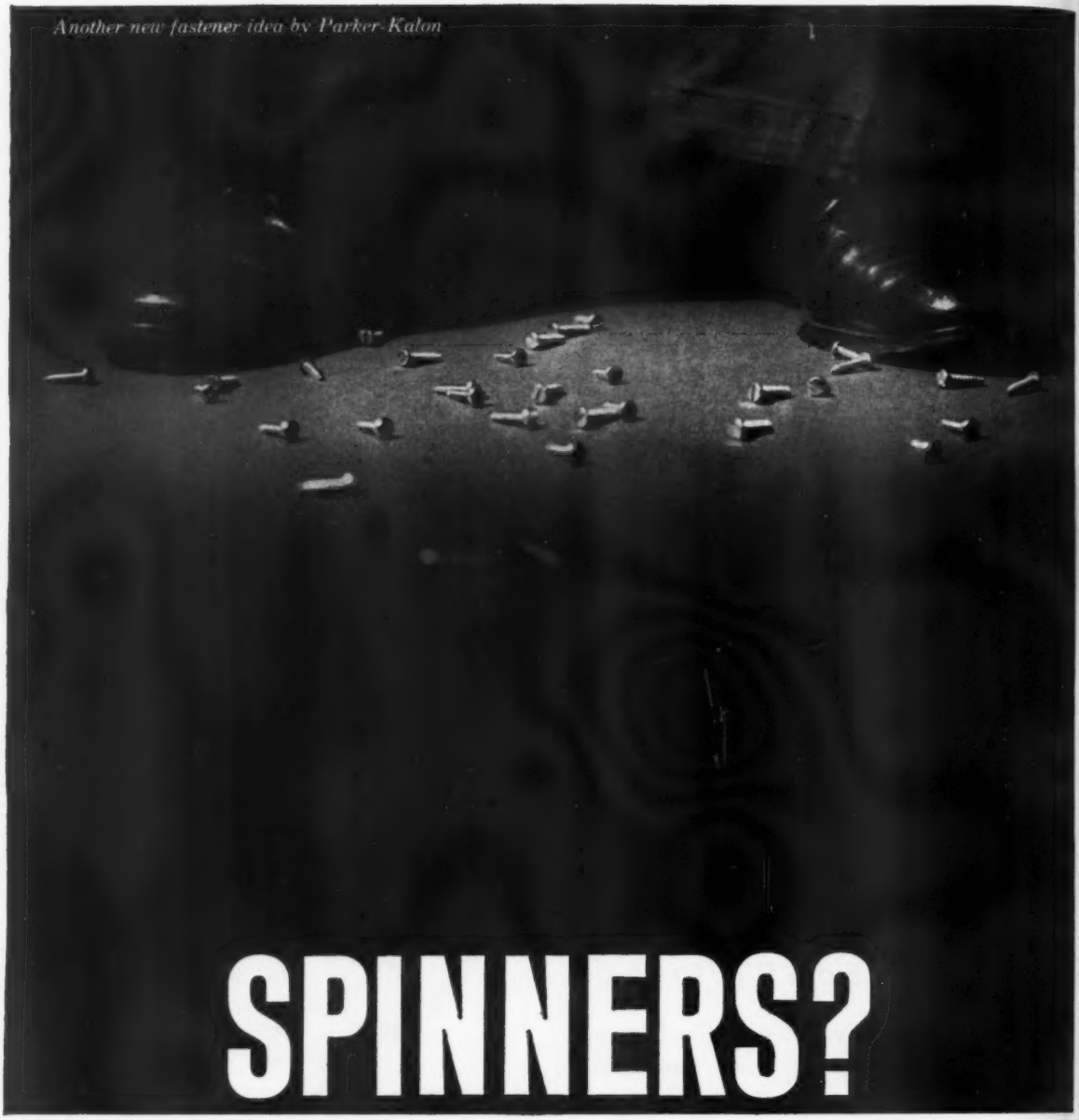

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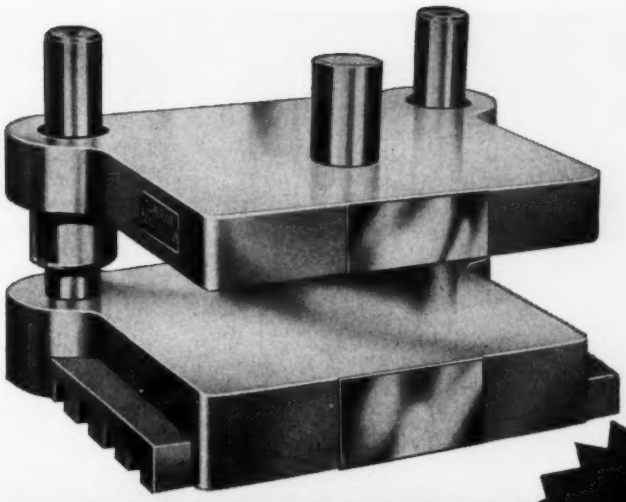

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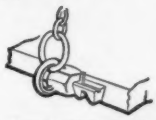

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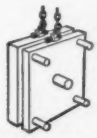

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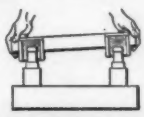

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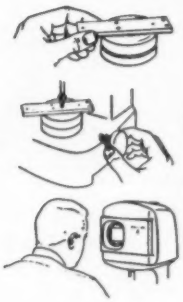

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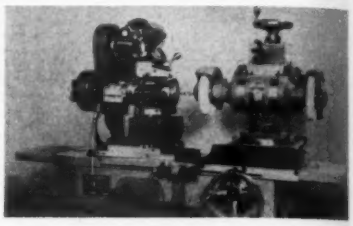


The chuck and draw bar assembly mount in the standard motor-driven fixture without alteration. The draw bar rotates in the closer on a precision needle bearing and thrust is taken on two shielded ball thrust bearings.

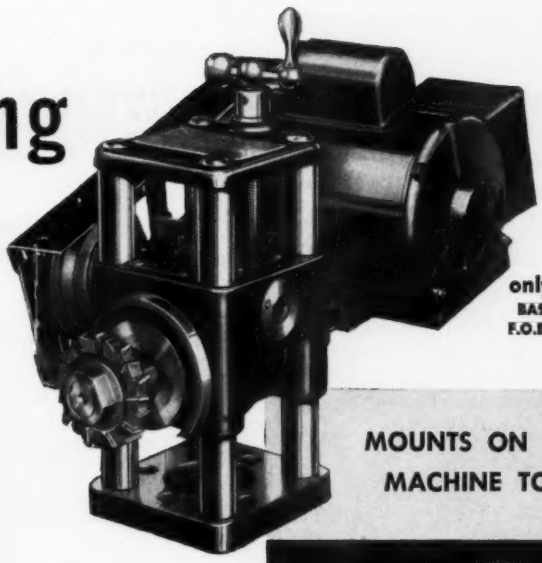
Included with the R-O collet closer are air regulator, filter, and oiler. For information, write to Royal Oak Tool & Machine Co., 29800 Stephenson Hwy., Royal Oak, Mich., or — **Circle Inform-A-Gram No. 71**

SPECIAL ARC WELD SETUP USED FOR UNUSUAL JOB

A special arc welding setup is used at Baker Perkins Inc. for welding low-carbon steel axles to 650-lb, S-shaped, cast stainless steel mixer blades, for mixing solid-liquid rocket and missile fuels. For this unusual job, the company designed a positioner utilizing an old lathe chuck and a variable speed drive to hold and rotate the work. This enables the operator to make deep penetrating welds around the circumference of the 4" dia axles.

They shrink fit the axles to the blade body prior to welding. Foot pedal arrangement enables the operator to control the powered positioner as he applies the stainless steel welding rod.

save machining costs with this versatile new tool



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● Compact, rigid, portable, this *new* machine efficiently performs in any position, as an independent unit with its own power and feeds, or added to machine tools—lathes, planers, shapers, millers, grinders. Saves handling, moving, set-up and down time.

Gives close tolerance, quality results while removing metal at *profitable* rates. Adapts quickly to standard machines, fixed machinery in place, pieces in fixtured set-ups, or on parts too big for standard machines. By taking Dumore Versa-Mil to the work, it gives you the advantage of machining where it is most economical!

For Maintenance, Job Shop, Tool Room and Production Uses

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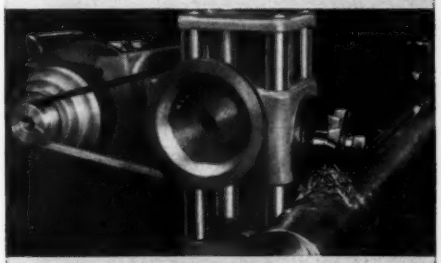
You Can Do More with DUMORE®

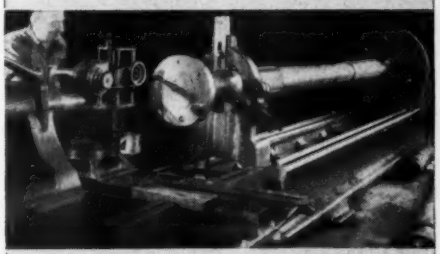
All-Purpose Precision Metalworking Tools

MOUNTS ON ANY MACHINE TOOL

Milling 5" Keyway on a Planer



Slotting 42"-Long on a Lathe



Boring and Drilling on a Lathe

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1304 Seventeenth Street, Racine, Wis.
Send Versa-Mil details ☐

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Company_____

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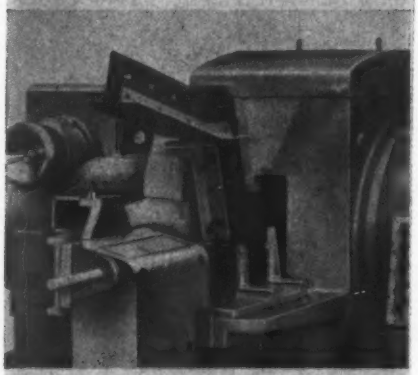
Versa-Mil ● Drill-N-Tap Units ● Drilling Units ● Drill Heads ● Micro-Drills ● Drill Grinders ● Precision Grinders ● Hand Grinders ● Flex-Shaft Tools ● Quills and Accessories

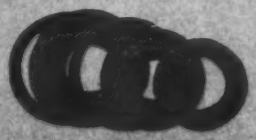
CIRCLE INFORM-A-GRAM KEY NO. 59

Simple Abrasive Change thru top of hood cuts down time. Three easy steps take approximately 30 minutes.



Pusher-Type Thru Feeder available. Provides high-volume production on work ⅜" to 7" O. D., and from ¼" to 1¼" thick.

Oscillator-Type Feeder Fixture also available. For very close accuracy where production volume is not large.



Besly-Titan Abrasive Discs and Wheels are available in a wide range of types and sizes. Experienced Besly Abrasive Engineers are operating nation-wide. For details, write to Besly-Welles Corporation, 20 North Wacker Drive, Chicago 6, Illinois.

NEW BESLY DH4...

Double Horizontal

Engineered to give you all these advanced, proved features

- simplified push-button operation
- accuracy to tenths
- automatic dressing
- automatic sizing
- centralized "one-shot" lubrication
- automatic return of abrasives to grinding plane after dressing or change
- rugged, rigid base
- push-button controlled quill feed
- built-in dial indicators for abrasive movement
- built-in "usable abrasive gage"
- built-in motor load meters
- dial indicator for precise head alignment
- universal head tilting with micrometer adjustment
- concealed wiring and piping

AND MANY OTHERS, **write for Bulletin DH4**

Choose The Features To Meet Your Needs

The DH4 Grinder is engineered and specifically designed to provide all the features mentioned here. If some of them are not required for your operations, you can specify only what you need. Should your requirements change later, the basic machine design permits easy addition of the omitted features. This Besly engineering principle lets you get exactly the machine you need with the features you need—without costly waiting or redesign.

Economically grinds parts and materials like these:

parts	bearing races piston rings gear blanks	valve plates pump vanes clutch plates	or any part with two flat surfaces of nearly equal area which must be parallel to each other
materials	steel cast iron and their alloys	non-ferrous metals carbides	ceramics plastics

makes disc grinding virtually AUTOMATIC

spindle disc grinder

Besly's Famous "Sealed Quill Construction"

is built into this *all-new* grinder. Removed from the motor and other mechanisms for highly sensitive feed control, the spindle sleeves are cradled in the heads. They are moved by the feed screw, sliding on replaceable lubricated ways with clearance adjustment provided. Precise disc and head adjustment is constantly maintained for consistent grinding accuracy.

BESLY

For complete engineering details—write for Bulletin DH4

BESLY-WELLES CORPORATION

Est. as C. H. Besly & Co., 1875
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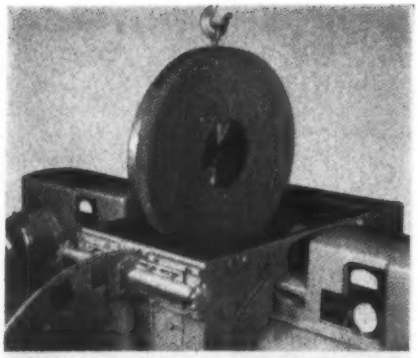
CIRCLE INFORM-A-GRAM KEY NO. 61



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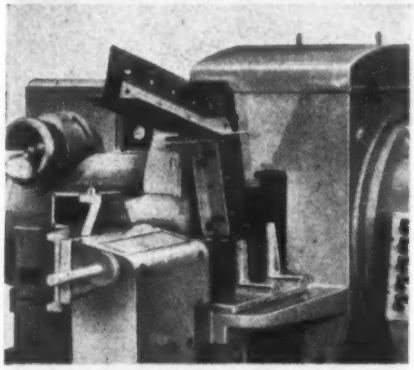

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Double Horizontal

Engineered to give you all these advanced, proved features

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- accuracy to tenths
- automatic dressing
- automatic sizing
- centralized "one-shot" lubrication
- automatic return of abrasives to grinding plane after dressing or change
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- push-button controlled quill feed
- built-in dial indicators for abrasive movement
- built-in "usable abrasive gage"
- built-in motor load meters
- dial indicator for precise head alignment
- universal head tilting with micrometer adjustment
- concealed wiring and piping

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Economically grinds parts and materials like these:

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materials	steel cast iron and their alloys	non-ferrous metals carbides	ceramics plastics

makes disc grinding virtually AUTOMATIC

spindle disc grinder

Besly's Famous "Sealed Quill Construction"

is built into this *all-new* grinder. Removed from the motor and other mechanisms for highly sensitive feed control, the spindle sleeves are cradled in the heads. They are moved by the feed screw, sliding on replaceable lubricated ways with clearance adjustment provided. Precise disc and head adjustment is constantly maintained for consistent grinding accuracy.

BESLY

For complete engineering details—write for Bulletin DH4

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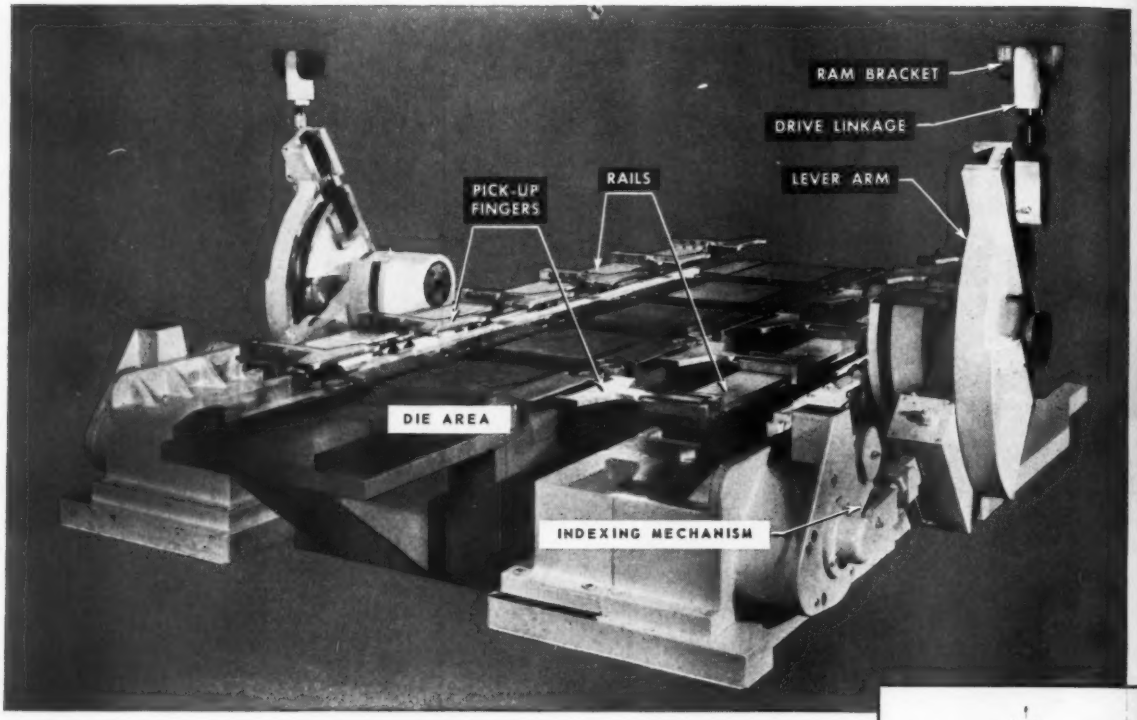
CIRCLE INFORM-A-GRAM KEY NO. 61

SHEFFIELD ~~PRESS PACERS~~

SUBSTANTIALLY INCREASE PRESS OUTPUT



The Sheffield Press-Pacers are all readily demountable transfer mechanisms used to automate one or a line of straight-side presses.

Any number of transfer operations within press capacity may be included. Thus, one press can be made to do the work of several.

Coil stock, blanks or pre-drawn work parts may be handled with equal facility.

OPERATION

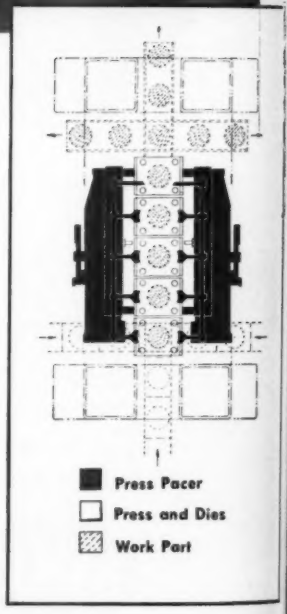
The Press-Pacer receives the work and advances it from die to die and from press to press—all automatically.

Work parts may be traversed in any desired direction—front to back, right to left or the reverse.

PRODUCT CHANGE DOES NOT OBSOLETE THE PRESS-PACER

Feed fingers are interchangeable and easily replaced when the product is changed. Traverse distance between dies and between presses is fully adjustable to changed requirements.

Installation of the Press-Pacer can be done in just a few hours. It may be removed from a press in a matter of minutes.



B005

Write for **Catalog No. PP3M-57 to the Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 20.**

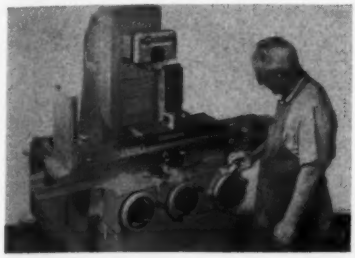
the **SHEFFIELD** *corporation*
of Bendix Aviation
manufacture and measurement for mankind

CIRCLE INFORM-A-GRAM KEY NO. 62

NEW SURFACE GRINDER RAPIDLY PRODUCES ACCURATE FINISHES

Brown and Sharpe has introduced a new surface grinder for rapid production of small- and medium-sized work with exceptional surface finish. The 618 Micromaster's unit construction permits all machines to be assembled to specific requirements.

The machine grinds 6" x 18" work and handles work 12" or 14" high, depending on handwheel placement. The new Oriflex drive to the flanged-type spindle gives smooth flow of power to the grinding wheel,



capable of utilizing the full overload of the 1 hp spindle drive motor without slippage. With the 8" wheel, the Oriflex drive runs at 2860 rpm, and the direct motor drive spindle, with 7" wheel, runs at 3450 rpm.

The sturdy spindle slide upright moves transversely on ground guide ways infinitely responsive to the cross feed handwheel. This eliminates the conventional carriage, prevents table "twist," and helps provide for accurate slot and form grinding.

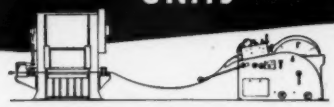
The cross feed and vertical feed handwheels have graduations to 0.0002", and an auxiliary dial adjacent to the handwheel gives a fine vertical feed and reads to 0.0001". For information, write Brown & Sharpe, Providence 1, R. I., or—

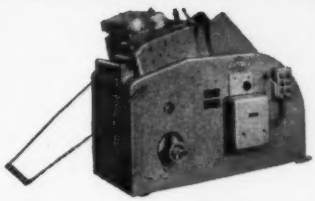
Circle Inform-A-Gram No. T2

To meet the needs of large users, the new Type M chromium carbide from Electro Metallurgical Co., Division of Union Carbide Corp., is being supplied in tonnage quantities. Chromium carbide has been successfully fabricated using power metallurgy techniques, and when bonded with nickel, it is used for parts such as gage blocks and hot extrusion dies for copper and brass.

LITTELL

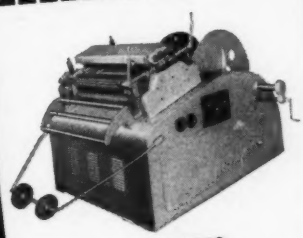
COIL CRADLE-STRAIGHTENER UNITS





No. 408H-C-20
CRADLE-STRAIGHTENER UNIT

Variable Speed Drive for Any Speed, 12 to 72 f.p.m. Cradle holds 2,000 lb. coils. 5-roll straightener handles stock 8" wide x .187" thick. Wider units for 42" wide x .046" thick. Available with Electric Clutch and Brake or with Oil Gear Drive. Some models of this size and type in stock for immediate delivery.



No. 638D-C100
CRADLE-STRAIGHTENER UNIT

Variable Speed Drive For Any Speed From 18 to 108 f.p.m. Air operated Cushion in Cradle eases coils up to 10,000 lbs. into position aligned with straightener head. 5 power-driven straightener rolls handle stock 14" wide x 1.87" thick or 42" wide x .125" in thickness.

SEE OUR CATALOG IN SWEET'S

HOLD **Heavy Coils In Small Space**

ALIGN **Coil With Straightener**

STRAIGHTEN **At Any Speed**

AUTOMATE **All These Functions**

All Standard Littell Cradle-Straightener Combinations have 6 to 1 Variable Speed Drives to supply straightened stock evenly at any speed within their range. Arm loop control automatically keeps proper slack in straightened stock moving to using equipment. Cradles handle any I.D. coils.

For High Speed — Sudden Stop Operation, an Electric Clutch and Brake can be furnished on the output shaft of the Variable Speed Drive. This feature eliminates starting torque strain. The Variable Speed Drive stays in running position, unaffected by the upward-downward movement of the loop control arm.

Oil Gear Drives can be furnished on these units for extra smoothness and arm controlled straightening speed within a range of 0 to 100 feet per minute.

Delivery is Good from the *larger* Littell Plant equipped to speed production.

USE THIS COUPON
or write for free catalog.

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Send Littell Coil Cradle-Straightener Catalog Sections "C".

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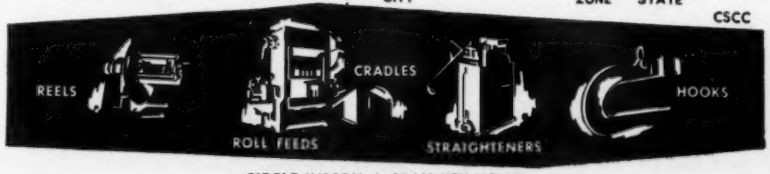
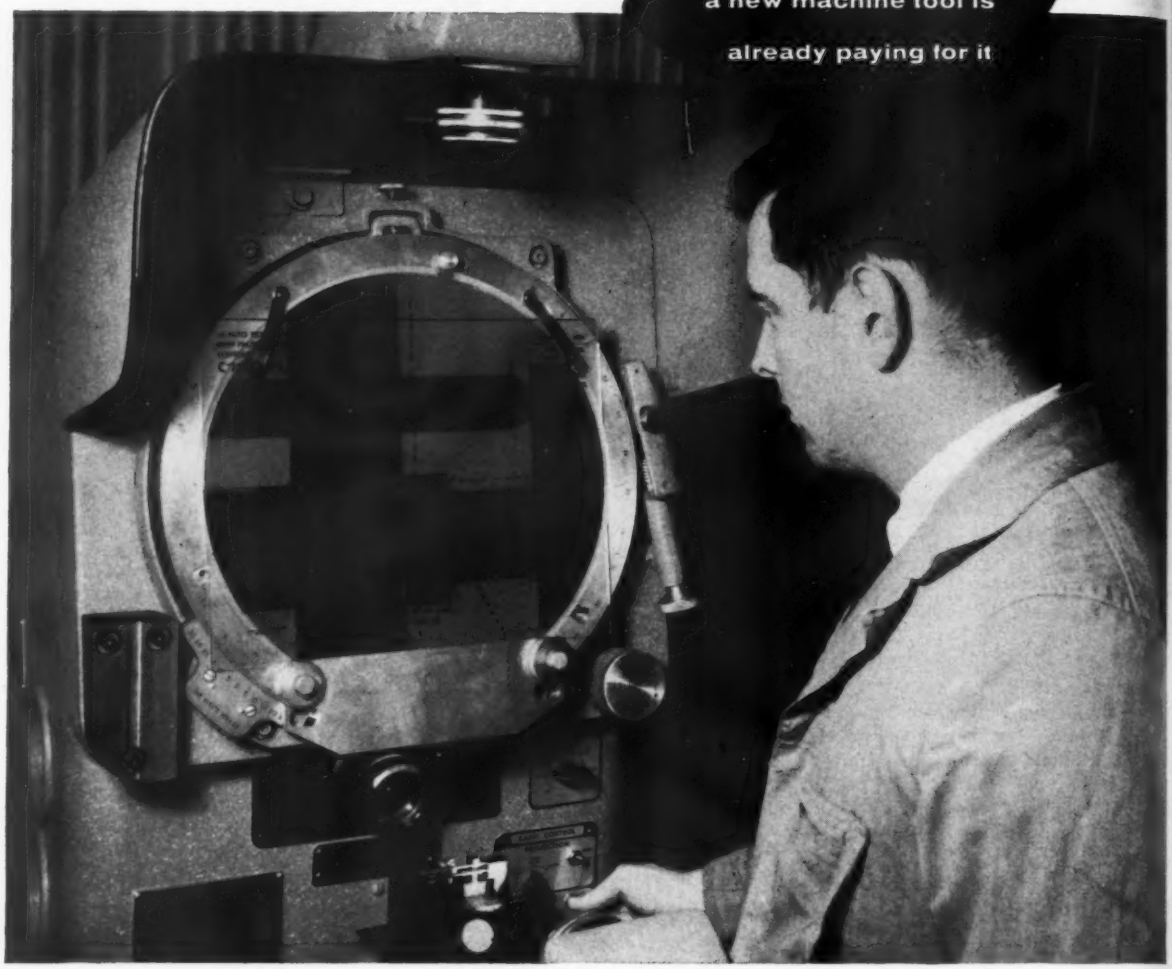


CIRCLE INFORM-A-GRAM KEY NO. 63

JONES & LAMSON OPTICAL COMPARATORS

the man who needs a new machine tool is already paying for it



J & L Comparators produce the sharpest, blackest shadow images

You've often heard the phrase, "There's more to it than meets the eye." This couldn't be truer than when referring to different types of Comparator performance. Screen illumination on J & L Comparators doesn't just *appear* to be brighter—it *is*. Prove it to yourself with a light meter. While doing this you'll find that J & L not only *produces* more illumination—but also *stops* more. Shadow images (which is what we really measure or inspect) are sharper, denser and distortion-free.

And here's something else; J & L Comparators are now being equipped with a NEW VARIABLE LIGHT INTENSITY switch, with built-in filament warm-up. Projection lamp life is materially increased as controlled screen illumination with maximum brilliance is assured. Illumination is reduced when using low magnification lenses and is increased for the higher power lenses. Light potential is used only as required, and lamps last longer.

Write for catalog 5700, which describes many features resulting from J & L's continuous research in optical inspection. Jones & Lamson Machine Company, 519 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CIRCLE INFORM-A-GRAM KEY NO. 64

CAN YOU MEET OR BEAT YOUR COMPETITION?

Comparison tests between Hydrive and manually operated turret lathes prove Hydrive superiority and speed

However, quality and precision are much more than secondary considerations. With Hydrive's hydraulically constant pressures any lateral dimension required can be maintained accurately. And with identical pressures pre-set into any production run, Hydrive will produce first and last pieces exactly the same. This consistency gives you less waste, less operator fatigue, and more inspection time. . . . Acme Hydrive will adapt to turret lathes from bench sizes to No. 5 and automatically operate the turret. Acme can automate the following functions: the cross slide, change spindle speed, advance bar stock, reverse direction of spindle rotation for tapping, and open and close collet and control them automatically with Hydrive.

For further information check this coupon. Also check for free showing of the Acme Hydrive film.

ACME

INDUSTRIAL COMPANY
206 North Laflin Street
Chicago 7, Illinois

☐ Send me your Hydrive literature.
☐ Make arrangements for us to see your Hydrive film.

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CITY_____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 65

HOW MICROHONING* OF GUIDE PIN BUSHINGS PROVIDES FUNCTIONAL PRECISION, LONGER LIFE, LOWER COSTS

HERE'S HOW Lamina Dies and Tools, Inc. uses Microhoning to generate final precision and functional surface characteristics in bushing bores at minimum cost.

Microhoning's low-velocity, controlled abrading technique removes a minimum of the bronze plating to obtain accuracy and functional surface characteristics. Thus, as much as possible of bronze plating is conserved and a uniform thickness of bronze throughout the bore is assured.

Above is a typical Lamina guide pin bushing. These bushings range in diameter from ¾" to 4½". An air operated, three-jaw fixture rigidly holds the work piece and is easily adapted to bushings of any size.

Because Microhoning tools have universal joints, they follow the neutral axis of the bore in generating round, straight cylinders. Since the bore location remains unchanged, concentricity between bushing I.D. and O.D. is obtained.

The combined reciprocating and rotating motions of the Microhoning tool creates on the bore surface a cross-hatch lay pattern that functions as a "built-in" lubricating system. For, the multitude of minute, diamond-shaped plateaus—over which the load is evenly distributed—are separated by a network of valleys that holds the lubricant. This better method of lubrication plus the clean-cut Microhoned surface prevent seizure or scuffing of bronze, bronze-plated and steel bushings. And, the self-dressing action of Microhoning abrasives maintains cutting efficiency to assure the same surface finish is developed in every bushing bore.

Learn how Microhoning provides efficient stock removal, closer tolerances and functional surfaces—SEND FOR FREE LITERATURE.

*Registered U.S. Patent Office

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 66

BOOK REVIEWS

AUTOMATIC PROCESS CONTROL, by Donald P. Eckman. Published by John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y., 1958. 368 pages, $9.

Principles of instrumentation and automatic control are treated in this book, with particular emphasis on process control and systems. Serving as an introductory text, it begins with process analysis and progresses to a discussion of the generalized behavior of closed-loop systems. Topics covered include process and controller characteristics; measuring, controlling, and final control elements; process instrumentation; and sinusoidal and stability analysis. Answers are supplied to the problems presented at the end of each chapter.

MAN, METALS AND MODERN MAGIC, by J. Gordon Parr. Published by The American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio, 1958. 253 pages, $2.95.

The level of our modern society is measured by our knowledge of metals; how to extract them, and how to combine and process them for human use. The author traces the interrelated progress of metals and men — from the accidental discoveries of primitive man to the modern electron theory — showing how man has shaped metals and how, in turn, he has been shaped by them. This highly informative, non-technical book is well written and will hold the reader's interest, whether he is in a "metals" industry or a user of metals in everyday life.

AUTOMATION IN PRACTICE, by S. E. Rusinoff. Published by American Technical Society, 848 East 58th St., Chicago, Ill., 1957. 261 pages, $6.50.

Increasing applications of automatic methods in the manufacturing and metalworking industries are surveyed briefly in this book by Professor Rusinoff of Illinois Institute of Technology. Materials handling and processing, and quality control applications of automation, as practiced in large and small industries, are discussed. The excellent illustra-

tions and clear step-by-step how-to-do-it descriptions of machines and processes contribute to the effectiveness of this survey. Topics covered include controls and control devices, conveyor systems, assembly operations, inspection; and production, casting, pressworking, machining, heat treating, and joining of metals.

MANAGEMENT FOR ENGINEERS, by Roger C. Heimer. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y., 1958. 453 pages, $6.75.

With the inclusion of more and more engineers in the ranks of management, a knowledge of management techniques and responsibilities is becoming as important to the engineer as his trusty sliderule. The author of this book emphasizes that management decisions cannot be made merely by manipulating a sliderule; economic, social, and psychological factors play a part in decision making. This book acquaints the engineer with these factors and shows the effect they have on management and engineering considerations. This is done by examining such things as the legal forms of business organizations; the cost, interest, depreciation, and profit in a business; and inventory, standards, and labor efficiency. The final chapters discuss problems involved in actual decision-making situations.

MATERIALS HANDLING APPLICATIONS, by D. Oliphant Haynes. Published by Chilton Co., Philadelphia 39, Pa., 1958. 381 pages, $12.50.

The effective and economical use of all types of materials handling equipment is demonstrated in this volume which supplements the author's earlier book, Materials Handling Equipment. Methods of analyzing materials handling needs and devising the best possible program to meet these needs are presented, with emphasis on efficiency and cost-saving. Techniques for adapting available equipment and limited work space to handling of exterior and interior containers, bulk materials, fragile and hazardous articles, and materials of special temperature or shape, are discussed. More than 1100 illustrations aid the reader in visualizing the wide variety of equipment and applications.

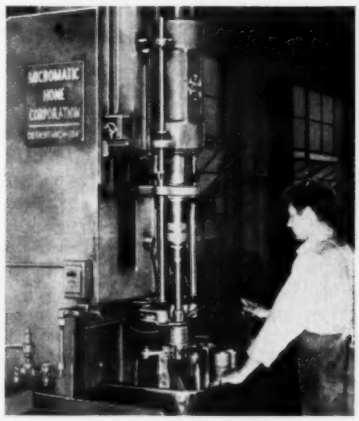
Buy U. S. Savings Bonds

WHY MICROHONING* OF GUIDE PIN BUSHINGS ASSURES FUNCTIONAL PRECISION, LONGER LIFE, LOWER COSTS

Lamina Dies and Tools, Inc., a pioneer in the development of bronze-plated guide pin bushings (bronze is electroplated on hardened steel for combined strength and smoother action), required a processing method that would economically produce bushing bores having dimensional precision, accurate geometry, functional surface characteristics, and consistent duplication to exacting specifications in every bushing.

In developing processing methods for the bushing bores, Lamina engineers found that Microhoning is best for generating final precision and functional surface characteristics at lowest cost per bushing.

Bronze, bronze-plated or steel bushings from ¾" to 4½" in diameter are Microhoned on this Hydrohoner. Stock removal is from .001" to .003" and average unit cycle is 30 seconds. Machine is equipped with automatic size control and tool expansion.



Characteristic cross-hatch lay pattern

Why? Because Microhoning generates a round, straight cylinder along the neutral axis of the bore; size and geometry of bushings up to 2½" in diameter are held to .0001" tolerances; contact area between bushing and guide pin is 25% greater than obtainable by other final processing methods. In addition, the characteristic cross-hatch lay pattern generated by Microhoning provides a "built-in" lubrication system in each bushing bore. This combined with the clean-cut surface prevents seizure or scuffing during operation of bushing. Finally, the self-dressing action of Microhoning abrasives assures continuous cutting efficiency and identical geometry, dimensions and surface finish in every bushing bore.

Thus, Lamina realizes, through Microhoning's generation of quality surfaces and precision bores, the full performance potential of bronze, bronze-plated or steel guide pin bushings—longer life, smoother action, lower costs.

Learn how Microhoning provides efficient stock removal, closer tolerances and functional surfaces—SEND FOR FREE LITERATURE.

Registered U.S. Patent Office

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 67

Air — 150 psi
Hydraulic up to 1500 psi
Meet JIC Standards

Fit like a hand in a glove where space is limited

O-M *Internal Key Round-Line Cylinders, Air and Hydraulic*

THAT'S why this O-M original Round-line of Cylinders, that fit where others won't, is widely specified by design engineers when space, weight and streamlining are important.

There are other advantages in using these powerful, compact components. For example, they are of all-steel construction with bearing surfaces of bronze, have the lowest coefficient of friction of any cylinder, and deliver continuous, smooth, dependable power at low or high speeds.

In addition, they are simple to install and service. The end plugs are tapped for universal mounting, and the ports can be oriented to any position. These cylinders are quickly and easily modified to fit special applications.

Available in a complete range of sizes (1½" to 8" bores) with standard 2 to 1 or oversize rods. Also full line of mounting brackets interchangeable bore for bore. Immediate delivery on many sizes.

Write today for catalog 101A.

ORTMAN-MILLER MACHINE CO.

21 143rd Street, Hammond, Indiana
☐ Have representative call
☐ Send Bulletin 101A

Name_____ Position_____
Company_____
Address_____
City_____ Zone_____ State_____

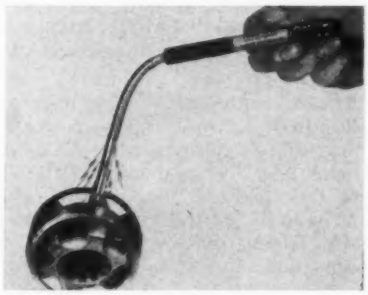
CIRCLE INFORM-A-GRAM KEY NO. 681

Products & Processes

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

Solve Your Precision Methods Problems with these adaptable worktables, Swaptops, outlined in a bulletin. Features include quick-change work tops, steel ribbed frames, cam locked adjustable legs, and fast rigid assembly. Dimensions and construction tips are included in this bulletin from Johnson Products Inc., Wilton, Conn., or —
Circle Inform-A-Gram No. A1

For Chip Removal and recovery of parts from hard to reach areas, use this powerful adjustable pocket-magnet. The small unit has finger-



tip controlled extension and a ⅜" dia retractable magnet shaft. Boyd Electronics, 6058 Woodward Ave., Detroit 2, or — **Circle No. A2**

A 64-Page Machinery Catalog describes and illustrates the stock of new, used, and rebuilt machinery available from Interstate Machinery Co., Inc., 1431 W. Pershing Rd., Chicago 9. Details on machine tools and fabricating equipment of all sizes and types are included. Get your copy from the company, or —
Circle Inform-A-Gram No. A3

A Variable Speed Pulley equips small motors for an extremely wide range of speeds. The high ratio pulley is a double variable pitch unit

which automatically adjusts the driver and driven sheave belt speeds according to its distance from the motor. For information, write Lovejoy Flexible Coupling Co., 4879-H W. Lake St., Chicago 44, or —
Circle Inform-A-Gram No. A4

Heavy-Duty Drilling can now be done with a power impact wrench, with an addition of a chuck to hold the drill. This impact wrench chuck

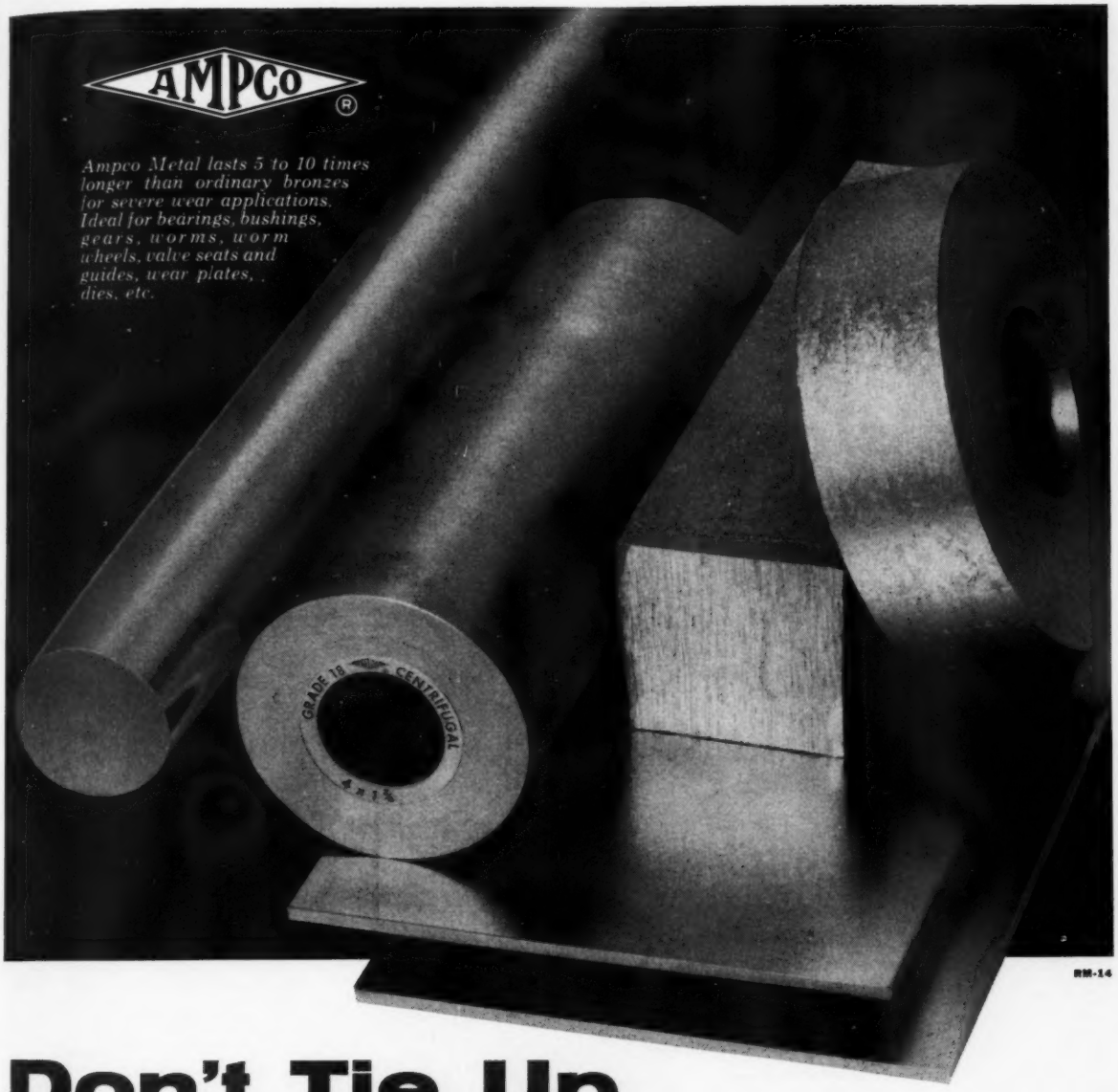
fits all ½" sq drive tools and holds ⅛" to ½" drills and features a keyless gripping action. Supreme Products Corp., 2222 S. Calumet Ave., Chicago 16, or — **Circle No. A5**

Vacuum Melting Techniques and high-temperature vacuum-melted alloys are discussed in new data and specification sheets available from Metallurgical Products Dept., General Electric Co., 11177 E. 8 Mile Rd., Detroit. One of the alloys presented is new Rene 41, a precipitation-hardening high-strength nickel base alloy. Get your data sheets from the company, or — **Circle A6**

Position Parts in Jigs and Fixtures with a new line of spring plungers which feature hardened steel plunger tips that won't mushroom even

under constant use. Light- and heavy-duty models are available in 10 sizes from 6/32" to 1". Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10, or — **Circle No. A7**

Removable Plastic Coatings for temporary protection of highly finished surfaces during fabrication, handling, and shipping are introduced in a booklet. Fast drying solvent solutions and plastic water dispersions come in specific types for different types of protection. Ask for literature from Guard Coatings Corp., Dept. K-1, 8-05 43rd Ave., Long Island City 1, N. Y., or —
Circle Inform-A-Gram No. A8


AMPCO
Ampco Metal lasts 5 to 10 times longer than ordinary bronzes for severe wear applications. Ideal for bearings, bushings, gears, worms, worm wheels, valve seats and guides, wear plates, dies, etc.
GRADE 18
CENTRIFUGAL

RM-14

Don't Tie Up Money in Inventory

Let **AMPCO**® *cut your cost of handling wear-resistant alloys for production and maintenance*

Your Ampco stock raw material distributor carries complete off-the-shelf stocks of Ampco Metal solid rods, Ampco 18 centrifugally-cast stock bushings, Ampco 8 sheet and plate, and Ampco 24 die blanks — in a full range of sizes — for immediate delivery.

Scrap and labor costs are reduced, because your Ampco distributor cuts rod, sheet and plate to the exact size you need. And — he's no farther away than your phone.

Here's the ideal way to hold your in-plant inventories and costs of copper-alloy products to a minimum.

Call your Ampco distributor now for your copper-alloy requirements and SAVE!

AMPCO METAL, INC. Dept. 57L, Milwaukee 46, Wisconsin

WEST COAST PLANT: BURBANK, CALIFORNIA • SOUTHWEST PLANT: GARLAND (DALLAS COUNTY), TEXAS

CIRCLE INFORM-A-GRAM KEY NO. 69

Products & Processes

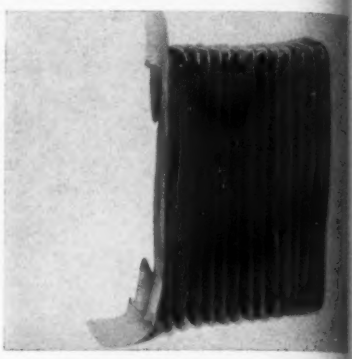
PRODUCTS & PROCESSES & PRODUCTS

A New Electrically-Heated High-Temperature Furnace for operation up to 3100°F without the requirement of protective furnace atmosphere, has been announced by K. H. Huppert Co., 6840 Cottage Grove Ave., Chicago 37. The KR-Super Model was designed for precision heat treating and general laboratory work. Get details from the company, or — **Circle Inform-A-Gram No. A9**

Methods of Degreasing Metal Surfaces are discussed in a bulletin available from L. Sonneborn Sons, Inc., 300 4th Ave., New York 10. Three types of emulsion cleansers and their uses are described. Get a copy of Current Topics 132 from the company, or — **Circle No. A10**

A Comparison Chart lists 241 grades of cold finished steel bars with machinability ratings given in surface feet per minute or percentages. Also included are grades of screw machine steels, carbon steels, open hearth steels, and alloy steels. Get your chart from La Salle Steel Co., 1420 150th St., Hammond, Ind., or — **Circle Inform-A-Gram No. A11**

This New Vertical Way Protector meets and locks into the horizontal way-covers on milling machines to protect the machine from flying chips. The flap-ends are folded in



and secured to the column end for extra protection where vertical and horizontal ways come together. A&A Mfg. Co. Inc., 712 S. 12th St., Milwaukee 4, or — **Circle No. A12**

"Industrial Products" gives information on Sun Oil's line of lubricants; greases; cutting, quenching and hydraulic oils; and solvents. Brief descriptions and applications are given for each one in these categories. For your copy, write to Sun Oil Co., Industrial Products Dept., 1608 Walnut St., Philadelphia 3, or— **Circle Inform-A-Gram No. A13**

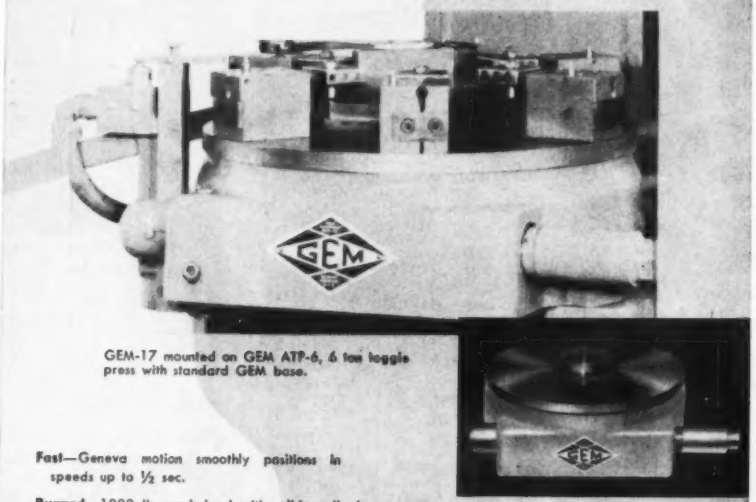
"Screw Thread Metrology Laboratories" is a booklet which reviews the function and facilities of the three laboratories opened by Standard Pressed Steel Co., Jenkintown, Pa. A 7-page appendix contains pertinent data on screw thread dimensions and tolerances. Get your copy from the company, or — **A14**

Magnetic Equipment is the subject of a bulletin announced by Sterns Magnetic Products, Div'n of The Indiana Steel Products Co., Valparaiso, Ind. Products for protection against tramp iron and material handling equipment are discussed. Get your copy from the company, or — **Circle Inform-A-Gram No. A15**

"Magnesium in the Electronics Industry" describes the use of magnesium in airborn and air-transportable electronics equipment. The 20-page booklet discusses magnesium's light weight, temperature resistance, and damping capacity. Write to The Dow Chemical Co., Midland, Mich., for your copy, or — **Circle No. A16**

precision indexing to ±0.001"

. . . WITH GEM-17 DIAL INDEX TABLE



GEM-17 mounted on GEM ATP-6, 6 ton toggle press with standard GEM base.

Fast—Geneva motion smoothly positions in speeds up to ½ sec.

Rugged—1000 lb. work load with solid anvil capacity of 30 tons.

Positive lock—Bolt in Geneva slot cammed both in and out given positive locking.

Power—Comes complete with rotary air motor, solenoid valve with limit switch (fluid or electric motors available).

Number of stations—6, 8 or 12 standard, 3 and 4 skip.

Size and weight—200 lbs. complete with 17" dia. table (plates up to 36" available).

Geneva Motion GEM-17 Indexing Table *standardizes automation on your assembly and machining operations . . . drilling, tapping, riveting, spinning, staking, knurling, chamfering, welding, screwdriving, stud driving and gaging to the speed and accuracy required. Gray's complete engineering staff can adapt the table to your work problem.*

Send for Bulletin DI-17 and complete information.

gem **GRAY equipment company**

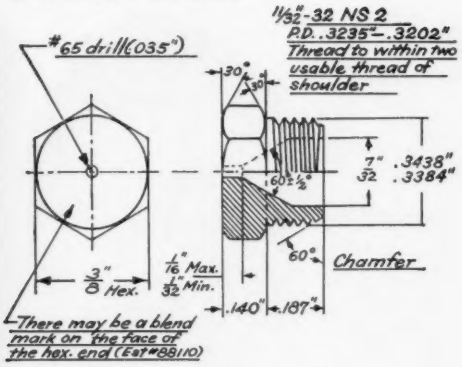
automatic assembly equipment

13600 Ford Road • Dearborn, Mich. • Telephone: Tiffany 6-7573

CIRCLE INFORM-A-GRAM KEY NO. 70

BETTER MACHINING STARTS WITH ALCOA SCREW MACHINE STOCK

DO YOU MAKE PARTS LIKE THIS?



1 1/32"-32 NS 2
P.D. .3235"-.3202"
Thread to within two usable thread of shoulder

MULTIPLE SPINDLE LAYOUT

Pc. No. V-10954	Time Per Pc.: 1.4 Sec.	Date: 7-21-55
Machine: ½" Dav.-Mod. "B"	Material Size: ⅛ Hex.	Material Grade: 2011-T3
Spindle R.P.M.: 3000	Chucks: ⅛ Hex.	Fingers: ⅛ Hex.
Spindle Gears: 42-21	Feed Gears: 60-30-60-80	
Kind of Threading Spindle: Steel	Ratio: 4:1 On 2:1 Off	
Threading: Rev.	Total Usable Rev. Pc.: 45	
Surface Speed: 340 Stock Ft. Per Min.	Min. Index Time: 2/5 Sec.	

SEQUENCE OF OPERATIONS

OPERATION	RISE	LEV.	FEED	CAM NO.	TOOL	HOLDERS
1—Box .338" dia.	.250	1.	.0055	¼	Pick-up Std.	#20 Box Tool
Center					Pick-up Std.	in Above Tool
2—Drill 17/32" dia.	.250	1.	.0055	¼	60 Point 17/32 Drill	#20 Floating
Form	.125	1.	.0028	⅛	(Carb) V-10758	Circular
3—Drill .035" dia.	.125	1.	.0028	⅛	#65 Drill	#20 Floating
c o Part way	.125	1.	.0028	⅛	1/16 Th. Std.	Circular
4—Thread		1.11		#2	11/32-32 NS-2 Chasers	#101 H&G Die Head
5—Ream 60° angle				High Point Cam	V-10758	#20 Floating
Cut-off	.125	1.	.0028	⅛	1/16 Th. Std. Grind to .057"	Circular

PRODUCE THEM FROM ALCOA ALUMINUM SCREW MACHINE STOCK

ALCOA® Aluminum Screw Machine Stock gives three times more parts per pound than steel or brass. Of course, it's easier to move, stock and handle.

A free-machining metal, aluminum turns at remarkable feeds and speeds—1,000 ft/min is common. Aluminum retains the surface finishes produced by machining. You can polish, buff, brush or burnish it.

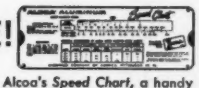
Aluminum doesn't punish tools. There's minimum down time for maintenance. Less heat, too—you can use lighter oils. Because aluminum resists corrosion, parts don't deteriorate in storage.

Find out more about better machining with ALCOA Screw Machine Stock. Here's how to do it:

- Meet Tom Conroy, ALCOA's field consultant. He'll be glad to demonstrate aluminum's advantages. See coupon.
- Ask for immediate stock delivery by calling the nearest ALCOA sales office or distributor.

ALCOA THEATRE
Fine Entertainment
Alternate Monday Evenings

FREE!



Send for Alcoa's *Speed Chart*, a handy slide-rule calculator for every screw machine operator—and *Alcoa Aluminum in Automatic Screw Machines*, valuable procedures manual for production men.

ALCOA ALUMINUM

Look for this label . . . it's your guide to the best in aluminum value

Aluminum Company of America
876-M Alcoa Building, Pittsburgh 19, Pa.
Yes, I'd like to—
☐ hear from Tom Conroy
☐ have a copy of your book and a *Speed Chart*
Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State____

CIRCLE INFORM-A-GRAM KEY NO. 71

Ten-year-olds really shine on Sunday

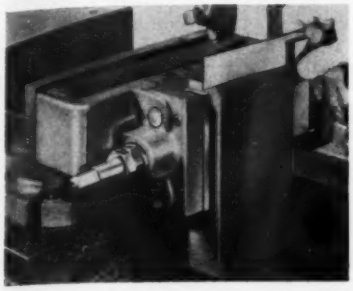
We're referring not only to juvenile cyclones, but also to those 10-year-old (and older) machine tools that are undermining production efficiency in plants everywhere. On Sunday your machines are idle – and it's the only day of the week the old ones are not losing money for you. Chances are that a performance comparison of your present surface grinding equipment with modern Blanchard grinders will open your eyes. Because unless your plant is an exception, it's safe to say that *your* surface grinders are obsolescent . . . are penalizing your production efficiency every working day. Find out how modern Blanchard grinders, equipped with Blanchard wheels, can boost production, improve quality and cut costs for *you!* Your Blanchard distributor is an expert in the field of grinding. On request he will gladly make an honest, accurate appraisal of the efficiency of your grinding production. Write or phone today.

BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 State Street, Cambridge 39, Massachusetts

Square Work Easily by simply securing a workpiece into this shaper vise attachment, the Squarite. Micrometer and vernier measure-



ments of overall dimensions and changes from length-wise to end-shaping can be done without moving the vise. Heinrich Tools Inc., Racine, Wis., or — **Circle No. A17**

Four Self-Bonding Methods of applying 0.003" anodized aluminum nameplates for product identification are described in a bulletin from W. H. Brady Co., 727 W. Glendale Ave., Milwaukee 9. It explains application of Quick-Plates to different surfaces and the tools available for production line application. Contact the company for your copy of Bulletin 177, or — **Circle No. A18**

Industrial Aerosol Spray Products are detailed in a booklet which gives their history and industrial applications. Specifications are given for Tool Maker's ink and cleaning oil, lubricating oil, multi-purpose grease, and color code paint. Direct requests for copies to Crown Industrial Products Co., Dept. TPC, 1003 Amsterdam St., Woodstock, Ill., or — **Circle Inform-A-Gram No. A19**

Hold "Impossible" Shapes with this All-Shapes vise announced by R. S. Wilder, Inc., 26 Bedford St., Waltham 54, Mass. A swivel and pivoting action combination allows

the two portions of the front jaw to equalize and adjust automatically to almost any shape. For information, write to the company, or — **A20**

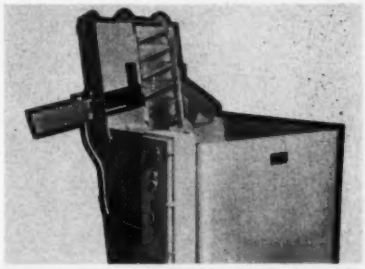
"Diamond Pioneering" discusses the industrial use of diamonds and shows some of the different kinds of tools for dressing grinding wheels and grinding deep and narrow grooves. Write Koebel Diamond Tool Co., 9456 Grinnell Ave., Detroit 13, for a bulletin, or — **A21**

Eliminate Hand Feed and speed production with this automatic bearing feeder. Model 2500-D elevates, orients, and feeds bearing parts into a wide range of high production machines. It's suitable for variable or constant-speed service and has an 18 cu ft hopper capacity. Feedall,

Products & Processes

PRODUCTS & PROCESSES & PRODUCTS

Inc., 38399 Pelton Rd., Willoughby, Ohio, or — **Circle No. A22**



LEMPCO STYLE "M" and "L" DIE SETS

NEW

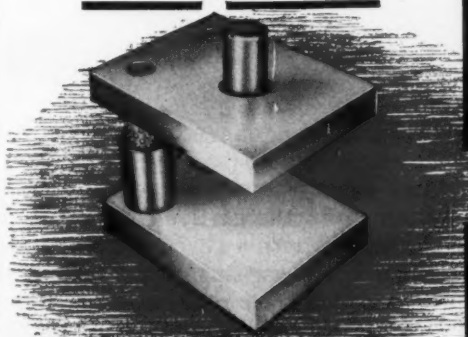
ALL-STEEL DIE SETS AT THE PRICE OF CAST IRON!

BALL-BEARING ANTI-FRICTION PIN BUSHINGS

EASIEST AND FASTEST TO ASSEMBLE OR DISASSEMBLE

PRECISE ALIGNMENT FOR MILLIONS OF STROKES

ZERO MAINTENANCE; ONLY CUP GREASE AT GRINDING TIME



NOW, Lempco's line of Precision Ball-Bearing Die Sets, includes new low-priced *all-steel* sets, Style "M" and "L", at the price level of *friction-type cast iron* die sets. Better write TODAY for New Low Prices!

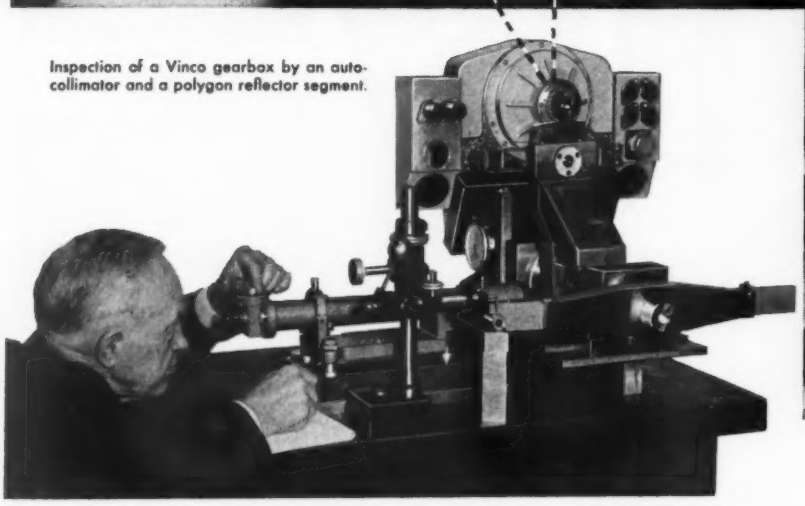
LEMPCO INDUSTRIAL, INC.
DUNHAM RD., BEDFORD, OHIO

WHERE QUALITY CONTROLS!

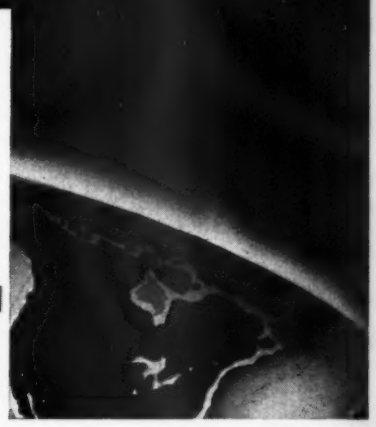
CIRCLE INFORM-A-GRAM KEY NO. 73

MISSILES GEARED TO A STAR BY VINCO

Accuracy of 3.6 seconds of arc.
Gear ratio 2,584,800 – 1.



Inspection of a Vinco gearbox by an autocollimator and a polygon reflector segment.



Test stands for missile guidance systems include a gearbox built by Vinco to isolate the gyro system from the earth's rotation. Driven by an 1800 RPM synchronous motor, with a gear head stepdown to 1RPM, it produces an output motion of one turn in one sidereal day. Output accuracy limit of 3.6 seconds of arc reflects the action of 8 Vinco gears and 9 precision ball bearings. It is equivalent to .00018″ error of motion at the pitch line of a 32 diametral pitch, 20° pressure angle, 20.625 pitch diameter output sector.

Such accuracy is a must for checking the error or drift of gyroscopic and inertial guidance equipment. The gears in the sidereal rate test gearbox were ground and inspected on Vinco equipment by Vinco craftsmen. This personnel and equipment are available for producing gears of the same high precision for you.

The Vinco Optical Master Inspection Dividing Head is the most accurate instrument of its kind for checking angular spacing. Accuracy is guaranteed within a total variation of 2 seconds of arc (± 1 second). This instrument is available in both standard and heavy duty models.

VINCO CORP., 9111 Schaefer Hwy., Detroit 28, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 74

Products & Processes

PRODUCTS & PROCESSES & PRODUCTS

Use This Heavy-Duty Lamp for intricate jobs requiring a strong, close-up light; on radial saws, drill presses, shapers, and lathes for example. Its 16" flexible arm permits

adjustment at all angles. Rockwell Mfg. Co., Delta Power Tool Div'n, 491 N. Lexington Ave., Pittsburgh 8, or — **Circle No. A23**

Multiple-Compartment Barrel Finishing Machines are illustrated and described in a bulletin offered by the Techline Div'n of Wheelabrator Corp., 1183 Avenue V, Vickburg, Mich. Applications, advantages, and construction features for various models are discussed. Write to the company for a copy of Bulletin 201, or — **Circle Inform-A-Gram No. A24**

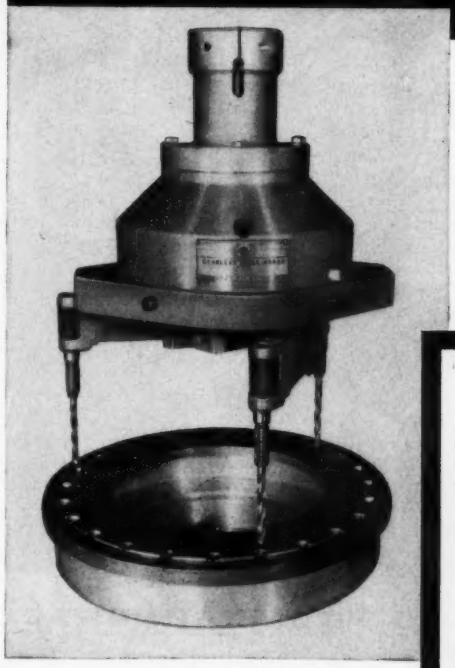
Standard Specification Sheets for die cast zinc alloy cap nuts cover three types: regular closed end cap nuts, regular open end cap nuts, and high closed end cap nuts. Sizes, design drawings, and applications are included. Write to Gries Reproducer Corp., 125 Beechwood Ave., New Rochelle, N. Y., for copies, or **Circle Inform-A-Gram No. A25**

The Pesco Automatic Warehouse System, discussed in a bulletin, offers maximum cube space utilization, consistent automatic handling, and maximum service with minimum maintenance. The bulletin also shows controls for automatic handling, scheduling, and inventory. Write Automatic Warehousing Branch, Pesco Products Div'n, Borg-Warner Corp., Bedford, Ohio, for this bulletin or— **Circle Inform-A-Gram No. A26**

A Small-Diameter Tubing selection and applications guide is a 12-page booklet which gives the form, characteristics, and applications of 63 standard and 26 special materials cold-drawn into small tubing. Specifications for special types of tubing are also included. Request Bulletin 41 from Superior Tube Co., 1733 Germantown Ave., Norristown, Pa., or — **Circle Inform-A-Gram No. A27**

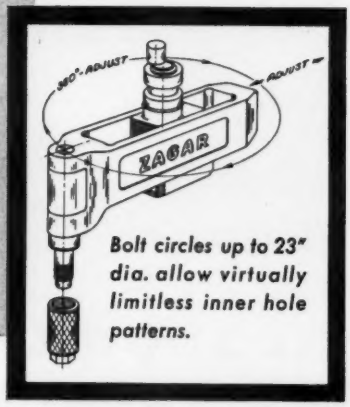
NOW - Zagar

presents a NEW CONCEPT of a MULTI-SPINDLE ADJUSTABLE HEAD



for

- *DRILLING*
- *TAPPING*
- *and REAMING*



Bolt circles up to 23" dia. allow virtually limitless inner hole patterns.

Here's an adjustable, multi-spindle head packed with features never before combined in a single tool. Zagar's famous, soundly engineered gearless drill head principle is applied to adjustable spindle drilling. There are NO universal joints, NO flexible shafts, NO bulky gear clusters.

The head is ready to use on any standard drill press for any machinable material. No auxiliary parts are needed. Spindle arms can be removed and replaced in minutes. Hole patterns can be changed as easily as spindles and at little cost.

Before you drill another hole, contact a Zagar representative, and—

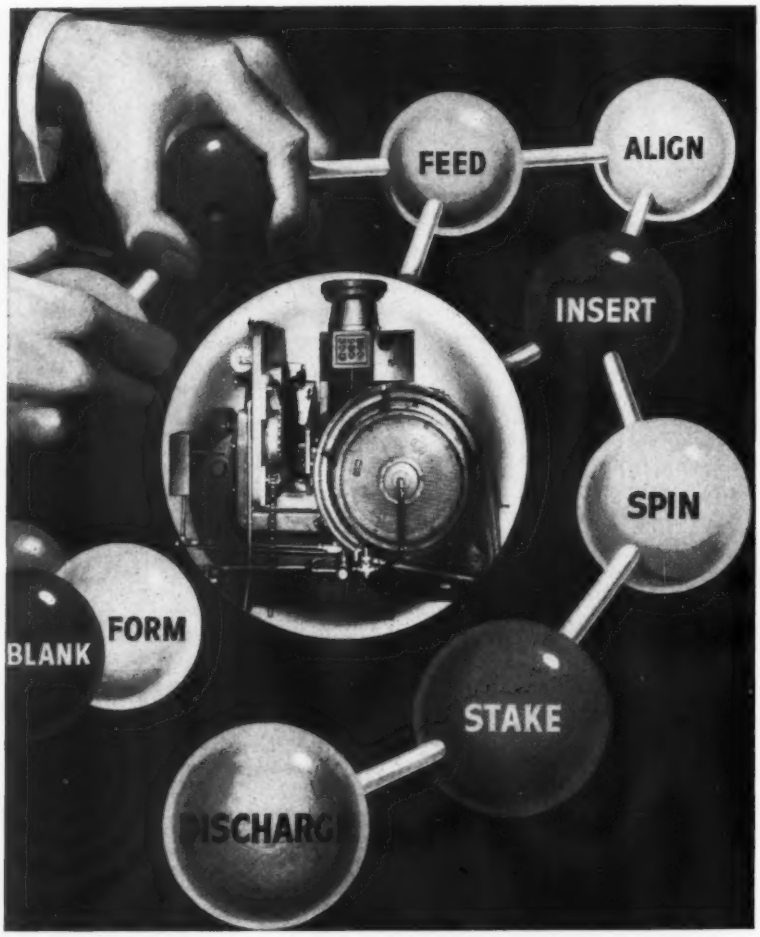
Write for Data Sheets 93-T-12.

Zagar

ZAGAR, INCORPORATED
23894 LAKELAND BLVD.
CLEVELAND 23, OHIO

TOOLS FOR INDUSTRY and SPECIAL MACHINERY

CIRCLE INFORM-A-GRAM KEY NO. 75



V & O TOOLED PRESSES

REDUCE DIRECT COSTS BY ELIMINATING THEM

For example, the press shown above brings together five parts, spins a pin at both ends, performs a staking operation and delivers continuous, linked chain. Operator simply loads links into a magazine and keeps hoppers filled with pins. Press does the rest – even automates quality control.

By tooling presses that combine jobs, V & O eliminates the material handling, semi-finished parts transfer and in-between inspection involved in non-integrated operations. For the majority of requirements, V & O uses standard types of V & O presses and standard types of feeds and accessories.

Perhaps you have ideas on how operations in your plant can be integrated to reduce direct costs. We would welcome the chance to discuss them with you. It's highly possible that we have already engineered units that, in principle, will meet your requirements.

Presses, special equipment and methods that automatically reduce costs

EMHART MANUFACTURING COMPANY
THE V & O PRESS COMPANY DIVISION
421 UNION TURNPIKE • HUDSON, NEW YORK
CIRCLE INFORM-A-GRAM KEY NO. 76

Products & Processes

PRODUCTS & PROCESSES & PRODUCTS

A New Gear Grease in a push-button aerosol can protects open gears, chains, cams, and wire rope. Gear-Lube spray provides a stringy webbing action carried from tooth to tooth as the gear rotates, and works under wet or dry conditions. Acrolite Products, Inc., 106 Ashland Ave., W. Orange, N. J., or — **Circle Inform-A-Gram No. A28**

Plastic Steel and other Devcon products are discussed in an application bulletin which gives hints for emergency and maintenance repairs. It shows by case histories how easy the clay-like plastic steel is to use and how it will bond with steel, bronze, iron, and aluminum. Get Bulletin 3 from Devcon Corp., Danvers, Mass., or — **Circle No. A29**

Cutting and Welding Equipment, pressure regulators, and accessories are presented in a 32-page bulletin. Complete specifications and ordering information are given for welding torches and tips, cutting torches and tips, and regulators. Obtain Catalog 586 from Harris Calorific Co., 5501 Cass Ave., Cleveland 2, or — **Circle Inform-A-Gram No. A30**

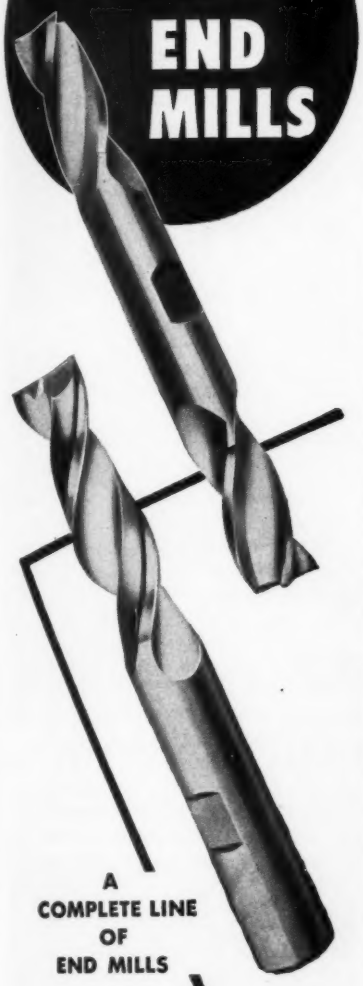
Gage and Sort up to 300,000 parts/hr, ± 0.0003", with the precision sorter introduced in a bulletin by U. S. Engineering Co., 40-24 22nd St., Long Island City, N. Y. The unit can be provided with from one to ten outlets for sorting machined parts, sintered parts, bearings, and studs. Get Bulletin B-35 from the company, or — **Circle No. A31**

Permanent Molds made from Meehanite metal for production of metal, glass, plastic, and rubber parts, are discussed in a bulletin. Typical shapes and applications are explained, and advantages of this type of mold are also given. Write to Meehanite Metal Corp., 71 North Ave., New Rochelle, N. Y., for a copy of Bulletin 23, or — **Circle Inform-A-Gram No. A32**

"Industrial Power Tools" is an 88-page catalog which describes the Rockwell line of drill presses, grinders, shapers, planers, joiners, lathes, and saws. Specifications and dimensional drawings of the tools and accessories are included. Get your copy from Rockwell Mfg. Co., Delta Power Tool Div'n, 497 N. Lexington Ave., Pittsburgh 8, or — **Circle Inform-A-Gram No. A33**

ESTABLISHED 1916

ARROW END MILLS



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Since 1916 Arrow has been a major supplier of End Mills — one of the oldest because Arrow has always been one of the best.

The Arrow line consists of all type of End Mills plus H. S. Steel and Carbide Tipped Specials.

ARROW TOOL & REAMER CO.
711 Stephenson Highway
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CALL YOUR ARROW DISTRIBUTOR

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1500° IN 5 MINUTES
2300° IN 30 MINUTES

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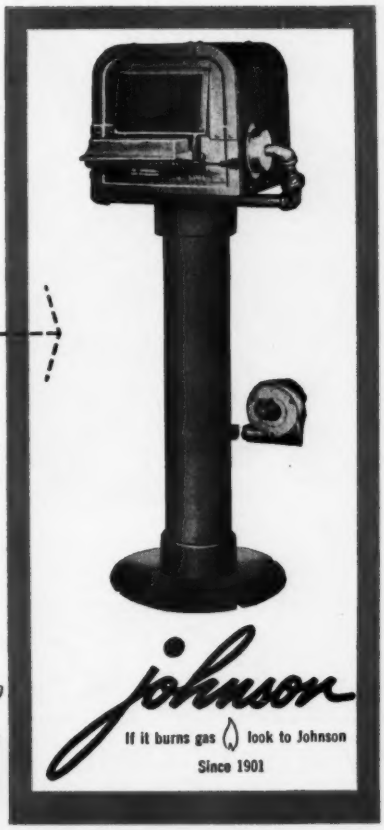
NUMBER 120 HI-SPEED FURNACE

That's the kind of quick heating action you get with this compact, powerful furnace. It's economical to operate, too. Fast heat-up saves time and gas. High-temperature insulated firebox, 5" by 7¾" by 13½", gives even hardening of high speed and carbon steel dies, tools and small parts. Temperature easily regulated. G.E. motor and Johnson Blower included. 120,000 BTUs per hour.

Pedestal style, F.O.B. Factory $184.00
No. 120 also available in bench style.

Write today for free Johnson Catalog
Johnson Gas Appliance Company
575 E Avenue NW, Cedar Rapids, Iowa



johnson
If it burns gas look to Johnson
Since 1901

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New!

ALINA SCROLL CHUCK

A truly high precision chuck developed to meet exacting requirements. The method of clamping the largest possible area of the circumference permits minimum use of pressure; fragile work is never deformed or crushed. In order to maintain this advantage chucks over 4" capacity are equipped with eight jaws.

Removable jaws are available in a wide variety of styles for internal or external chucking, or they may be had in blank form suitable for your own machining.

Simple design permits quick and easy replacement of the shank, and shanks to suit special requirements may be machined at minimum cost in any shop.

Six sizes from 2" to 6" to fit all machines. Furnished with or without shanks.

ALINA WRITE FOR LITERATURE AND COMPLETE CATALOG

ALINA CORPORATION
122 East Second St., Mineola, L.I., N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 773

New "Series 333" Drills for Drilling Cast Iron!

ACE

CARBIDE DRILLS

Whatever your carbide drill requirements may be . . . whether solid carbide or carbide tipped . . . it always pays to make sure you use an "ACE". Their "ground-from-the-solid", highly polished flutes have keener, stronger cutting edges. And that means finer accuracy, longer tool life, and lower drilling costs for you!

Call your local Ace Drill Distributor today!

NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

ACE DRILL
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

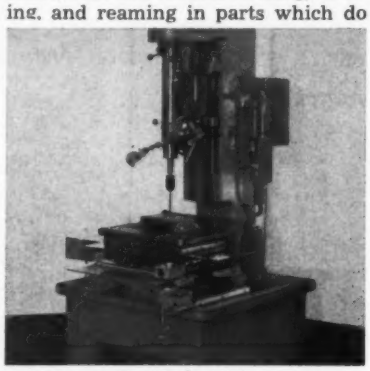
CIRCLE INFORM-A-GRAM KEY NO. 781

Toolroom

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

Hardened High Speed Steel Rods ground to 0.0002″ tolerances have been announced by Lavallee & Ide, Chicopee, Mass. Available in sizes from 3/64″ to ¼″ in 36″ lengths, the rods are ideal for making punches, dies, gages, arbors, and other tools and machine parts. Get details from the company, or — **Circle No. B1**

Economical Layout can be done with the Edlund No. 2 layout machine, that does center drilling, drilling, and reaming in parts which do



not require jig boring tolerances. Capacity is 1″ in cast iron and ⅞″ in mild steel. Edlund Machinery Co., 50 Huntington St., Cortland, N. Y., or — **Circle Inform-A-Gram No. B2**

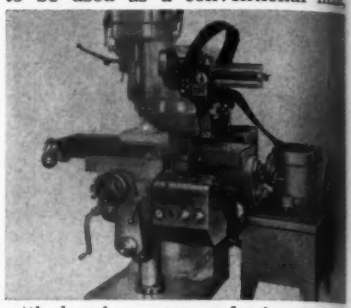
Economical and Long-Lasting Performance are features of the Flexo-matics, a new series of flexible toggle clamps. Die-cut and formed from high carbon steel, the clamps

have stainless steel rivets fitted into the burnished pivot holes. Six models are available from Detroit Stamping Co., Midland Ave., Detroit 3, or — **Circle Inform-A-Gram No. B3**

This Large Fixture Clamp, the 9F Saxton Kant-Twist fixture was designed for big jobs. It has been added to the line of other Kant-Twist Clamps of various sizes for various

jobs. For more information, write Saxton Mfg. Co., 1517 N. Potrero Ave. S., El. Monte, Calif., or — **Circle Inform-A-Gram No. B4**

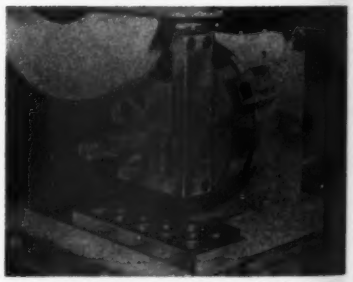
A Fully-Automatic Tracing System, Synchro-Trace, is adaptable to all makes of milling machines as a complete attachment for die sinking and mold making. It allows the mill to be used as a conventional mill,



with hand or power feed, or as a fully automatic die sinker. Cross or longitudinal feeds are infinitely variable from 0.002″ to 0.250″. True-Trace Sales Corp., Dept. SM, P. O. Box 3307, El Monte, Calif., or — **Circle Inform-A-Gram No. B5**

Drill Bushings for plastic tooling are outlined in a bulletin which gives dimensions and advantages of these new Redskin bushings. The outstanding feature of these bushings is that they discolor and smoke when the steel insert reaches 400°F to 500°F. American Drill Bushing Co., 5107 Pacific Blvd., Los Angeles 58, supplies copies, or — **Circle No. B6**

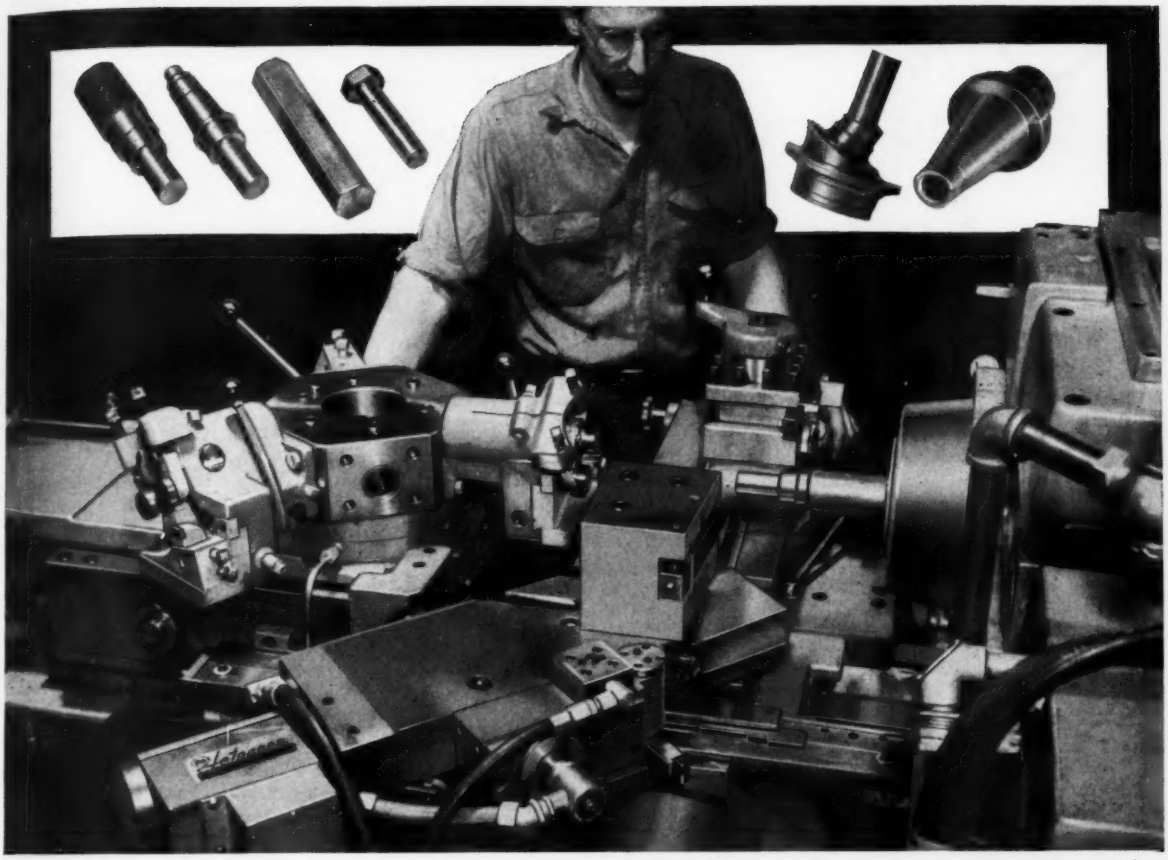
A Ball-Seat Punch Adapter, a precision attachment, locates and clamps ball-seat type punches in the Harig Grind-All fixture. The nib locates the ball-seat type punch in the



same relationship as it will be in the punch holder. Get details from Harig Mfg. Corp., 5757 W. Howard St., Chicago 31, or — **Circle No. B7**

An Expanded Tool Steel Stock List gives specifications on water hardening, air hardening, and oil hardening, plastic mold, hot work, and cold heading types. The booklet also contains a tool steel selector and properties guide. Get a copy from Uddeholm Company of America, Inc., 155 E. 44th St., New York 17, or— **Circle Inform-A-Gram No. B8**

Want to cut costs on parts like these?



Here's how tracing will help you save

The simple, basic setup shown above handles nearly 300 different parts for a well-known manufacturer of drive line components. All work is performed on one Gisholt MASTERLINE No. 4 Ram Type Turret Lathe with a JETracer on the rear of the cross slide. Standard tools on the hex and square turrets are used to face, chamfer and reduce the stock while the JETracer finishes all diameters, steps, blends and radii. The 6⅜"-long, 2"-diameter stepped shaft (above at left) is typical and is completed in two operations with total f.t.f. time only 4.95 minutes.

Here are just a few things the JETracer can do for you:

- **Shorten setup and change-over time**
- **Simplify machining and eliminate operator errors**
- **Save cost of form tools, multiple tool blocks and holders**
- **Reduce inspection time (only one length and one diameter need checking)**
- **Minimize or eliminate secondary operations (through finer finish, greater accuracy)**
- **Increase production through automatic machining of complex surfaces**
- **Free operator to handle extra units or perform other work**

Gisholt has developed a complete line of JETracers for use with ram and saddle type turret lathes, automatic turret lathes and single-spindle chucking lathes. These include rear cross slide, turret and independent slide mounted units, single or multi-pass types. *All are designed to operate at full capacity of the machines to which they are applied, without limiting machine functions or restricting the use of standard tools.*

You'll want to see for yourself how the JETracer adds flexibility, speeds operations and cuts costs on standard and problem parts. Send the coupon today for your free copy of the new JETracer catalog, or call your Gisholt Representative for complete information.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT MACHINES WITH NEW-MACHINE GUARANTEE

Gisholt Machine Company
1203 E. Washington Ave.
Madison 10, Wisconsin

Please send a copy of the new Gisholt JETracer catalog.

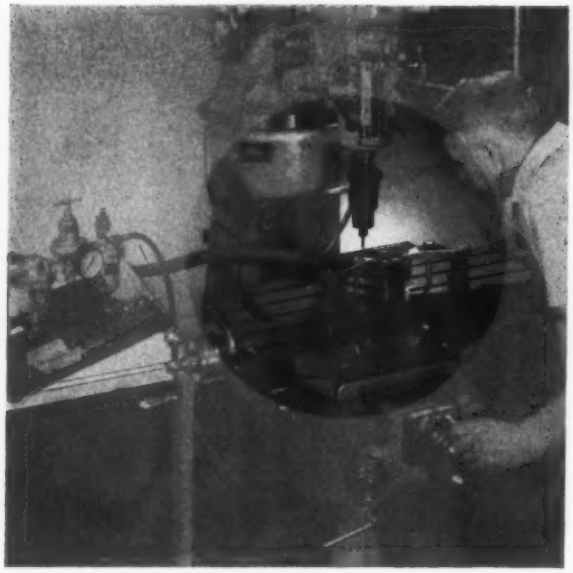
Name..... *Title*.....
Company.....
Street address.....
City..... *Zone*..... *State*.....

CIRCLE INFORM-A-GRAM KEY NO. 79

H○LES

JIG GROUND with

Vulcanaire



VULCANAIRE AND BRIDGEPORT MILLING MACHINE

Any Vertical Milling Machine can be used for jig grinding. These machines with micrometer standards can be used for jig grinding to close tolerances. Low cost jig grinding is possible with the Vulcanaire.*

*Provide yourself with this inexpensive instrument for use on your present equipment and JIG GRIND with a guarantee!

{ Borrow our instructive 11 minute movie on Jig Grinding. }

SERVICES OF YOUR TOOL ROOM IN DAYTON
ENGINEERING • PROCESSING • BUILDING • TOOLS
DIES • SPECIAL MACHINES • VULCANAIRE JIG
GRINDERS • MOTORIZED ROTARY TABLES • BREHM
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Vulcan's 41st Year

VULCAN TOOL COMPANY
741 Lorain Ave., Dayton 10, Ohio

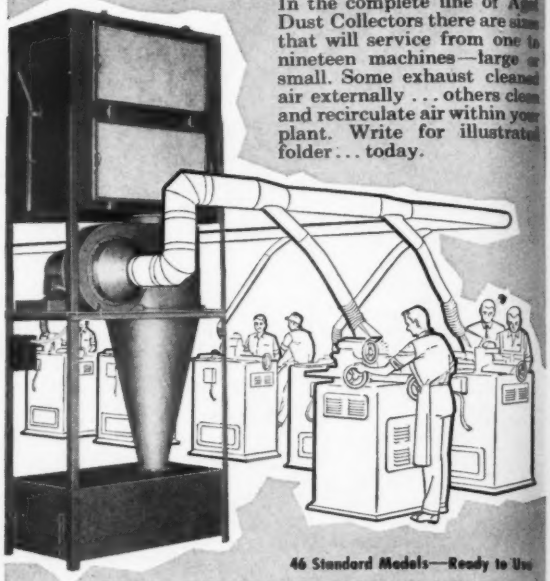
VULCAN tools

CIRCLE INFORM-A-GRAM KEY NO. 801

just ONE DUSTKOP STOPS DUST

heavy duty unit services up to 19 MACHINES

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



46 Standard Models—Ready to Use

AGET manufacturing company
1394 Church Street • Adrian, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 802

FREE... 64 PAGE CATALOG

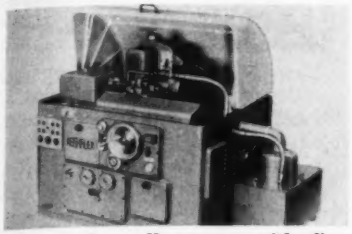
WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

COMPLETE DETAILED SPECIFICATIONS
ENGINEERING DRAWINGS • COST SAVING DATA
write for your copy—TODAY!

JERGENS TOOL SPECIALTY CO.
Dept. TP-12 712 E. 163rd St., Cleveland 10, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 803

A New Automatic Thread Grinding Machine is for high-precision thread-grinding on small parts, such as taps with straight and helical flutes, micrometer spindles, thread



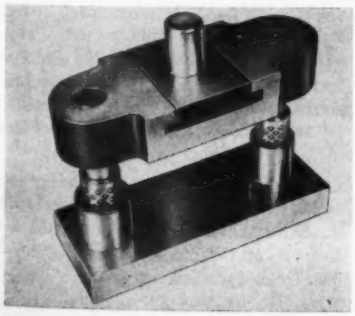
gages, and small worms with fine pitches. The Reishauer RAG has ¾" maximum workpiece dia and 20" distance between centers. Cosa Corp., 405 Lexington Ave., New York 17, or — **Circle No. B9**

For Fast Accurate Spotting of hole centers, use this hole center finder kit. In operation, the tool can transfer the location of a hole, establish

the center point of the hole, and mark the point for easy drill location. For information on the kit, write James Products Co., 801 Mentor Ave., Mentor, Ohio, or — **B10**

A Standard Jig and Fixture Parts catalog gives specifications and shows detailed diagrams of a number of components, including spring-loaded pins, swivel pads, reamed hole fixture keys, swivel screws, and torque screws. Get your copy from Techni-Tool Products Inc., Box 43063, Los Angeles, or — **Circle No. B11**

Aluminum Alloy Retainers are now featured in ball bearing die sets manufactured by Lempco Industrial, Inc., Bedford, Ohio. They



add long life. The Lempco guide pins used in the die sets are self-aligning, and maintain alignment for millions of strokes. For information, contact the company, or — **Circle No. B12**

This Machine can sharpen, polish, and deburr sharp edges of cutting dies, polish any inside or outside contoured surface, and remove flashings from small die castings. It uses a 1" wide endless abrasive belt and has a speed of 2,600 fpm. Chicago Cutting Die Co., 2333 Nelson St., Chicago 18, or — **B13**

Toolroom

PRODUCTS & PROCESSES & PRODUCTS

Both Lines of Dixie Die-Sinking Cutters, with straight and eight-hand spiral flutes, are now offered at the same price. They can be used

with duplicating equipment or as singular tapered end mills. They come in overall length of 2½". Dixie Tool Industries, Inc., Bridgeport, Mich., or — **Circle No. B14**

Illustrated—Logansquare Cylinder Meets J.I.C. Standards

Look to Logan

the ultimate in air cylinder design

FREE SEND FOR THE "LOGAN CALCULATOR"

MEMBER: Natl. Mach. Tool Builders' Assn.; Natl. Fluid Power Assn.

LOGANSPORT MACHINE CO., INC.
844 CENTER AVENUE, LOGANSPORT, INDIANA

PLEASE SEND COPY OF CATALOG:

- ☐ 100-1 AIR CYLINDERS
- ☐ 100-2 MILL TYPE AIR CYLS.
- ☐ 100-3 AIR DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
- ☐ 100-5 LOGANSQUARE CYLINDERS
- ☐ 100-5-1 ULTRAMATION CYLINDERS
- ☐ 300-2 PRESSES
- ☐ FACTS OF LIFE
- ☐ 200-1 HYD. POWER UNITS
- ☐ 200-2 ROTOCAST HYD. CYLINDERS
- ☐ 300-3 750 SERIES HYD. CYLINDERS
- ☐ 200-4 and 200-7 HYD. VALVES
- ☐ 200-6 SUPER-MATIC CYLS.
- ☐ 300-1 CHUCKS
- ☐ ABC BOOKLET
- ☐ CIRCUIT RIDER

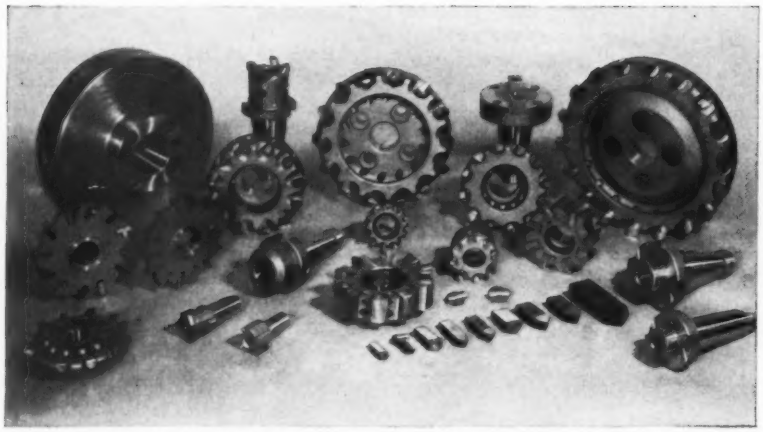
TO:

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CIRCLE INFORM-A-GRAM KEY NO. 81



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

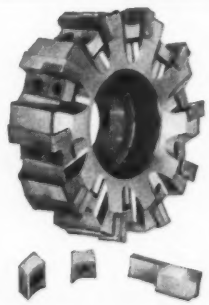
Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW "JOYDEX"

This performance-proved face mill features indexable blades for low cost-per-edge cutting. Exclusive design improvements include — adjustable anvils • extra deep chip flutes • fast, easy indexing • sweep blades for fine finish • double positive or combination positive and negative rake angles merely by changing blades • rugged, one-piece body • large locking screws. *Try out a new "Joydex" and prove its superiority! ("Joydex" data sheet is yours for the asking).*



Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 82

New Michigan district manager for Capewell Mfg. Co. is **Royal A. Wilson.** At the same time **Charles G. Mudge** was named sales engineer for the northern and central New Jersey and metropolitan New York area.

The Anderson Oil and Chemical Co., Inc., announces the appointment of **Thomas M. Purtell** as general manager of sales.

Now serving as director of sales engineering for Anadite Inc., is **Felton H. Havins.**

The Abrasives Division of the Elgin National Watch Co. announces the appointment of **Forrester B. Svendsen** as sales engineer in the New York and northwestern Pennsylvania area.

Changes in the sales branch of E. F. Houghton & Co. include **Frank Ross,** vice president of sales, and **Charles R. Schmitt,** assistant to the vice president of sales.

Frank W. Schreiner was recently named district manager of the Cleveland office of Pratt & Whitney Co., Inc. **Arthur C. Dade** is taking over as sales manager of cutting tools and gages in the Cleveland territory.

Donald F. Ross and **Harry L. High, Jr.,** now serve as Ohio branch managers for Dayton and Cincinnati, respectively, for The Carpenter Steel Co.

The addition of **Kenneth P. Martin** to the Sunnen Products Co.'s sales promotion department as industrial sales manager, has been announced by the company.

Heading the new New York City branch office for Pesco Products Division, Borg-Warner Corp., is **Joseph A. Wilson.** His territory covers New York, New Jersey, and Pennsylvania. The company also announced that the special factory representative of the Atkins Saw Division is **Jess Moore,** who will specialize in the metal cutting field.

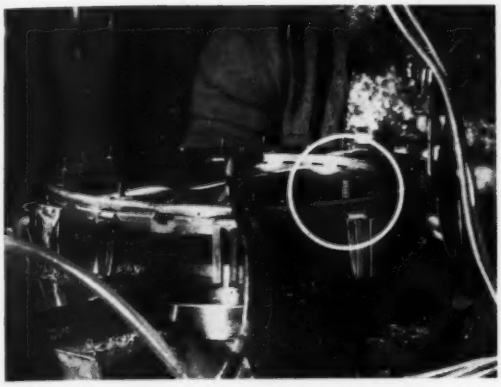
New Philadelphia district manager for the Pangborn Corp., **Jack K. Schultz,** will direct the sales activities and field engineering services from Jenkintown, Pa.

Jessop Steel Co. recently named **William P. Youngquist** as assistant to vice president-commercial. He will also help direct sales for the Green River Steel Corp., a recently acquired subsidiary.

Practical Tooling Tips

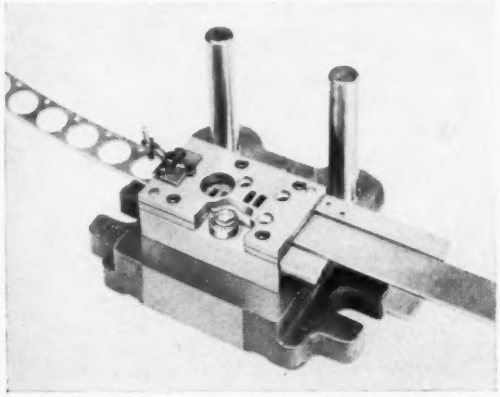
No. 3 of a series

Are your tool makers wasting time making complicated tooling gadgets when a standard, off-the-shelf Vlier part could do the job much better? Why not examine your present drawings and see where these simple, low-cost parts can be used. You will be amazed at the savings possible.



PRODUCTION INCREASED 300% when this 12-station automatic indexing and tapping fixture was put to work. Vlier Spring Plungers allow the operator to load by simply pushing the part into a slot. These simple, spring-loaded tools also position the part for the tapping operation. Available in four models; fifty sizes.

NEW SWIVEL PAD-TORQUE THUMB SCREW combines the Vlier Torque Thumb Screw and Swivel Pad Clamp. The result is a perfect holding tool—one that applies only the right amount of holding pressure without damaging the finished surface. Unique ball joint construction of the pad permits adjustment to off-angle surfaces.



PROPER STOCK ALIGNMENT IN PROGRESSIVE DIES becomes a simple task with the new Vlier Stock Pusher. Saves pilots. Mounts in tapped hole. Accommodates stock as thin as .010"; width variations totalling 1/16". Nothing to wear out or foul up.

NEW 1958 CATALOG NOW AVAILABLE—Eight pages; completely revised. Includes information and specifications on all new Vlier products, including the Torque Handle, Stock Pusher, Leveling Pad. Makes ordering easy. Suggests new uses for these proven time-savers. Write for your copy today!

VLIER
Engineering Corporation
A subsidiary of Barry Controls, Inc.
8900 Santa Monica Blvd. • Los Angeles 46, California

CIRCLE INFORM-A-GRAM KEY NO. 83

Don Oberg tells why the Moore Jig Grinder is an absolute must in any good die shop

by **DON E. OBERG**
General Manager
Oberg Manufacturing Co., Inc.
Tarentum, Pa.
Largest Manufacturer of
Carbide Dies

"One of the most important features of an Oberg-built die is guaranteed complete and positive interchangeability of parts throughout the life of the die. *This feature would be practically impossible without the application of Moore Jig Grinders.*

"With Moore Jig Grinders we can accurately locate holes with relation to each other as well as size holes to extreme accuracies. We can efficiently grind contours on carbide die sections which would be impractical by almost any other method. Back taper on contoured carbide die sections and piercing holes can be readily generated on Moore Jig Grinders.

"We feel it would be *practically impossible* to produce the high precision carbide dies required by industry today without the Moore Jig Grinder. *In our opinion it is an absolute must in any better-than-average die shop.*"

As Mr. Oberg points out, the Moore Jig Grinder has no equal on many essential toolroom operations. If you would like a bulletin describing some of the features that make this machine so outstanding, just drop us a line.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Connecticut

"The things we like best about our four Moore Jig Grinders are the sturdiness and dependable long-life accuracy built into them. Ours are used ten hours or more every day. Even with this high activity, we have found no apparent inaccuracies from our oldest to our newest machine."

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U. S. A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 84

***Experience**—the added alloy in **Allegheny Ludlum** tool steels*

Careful addition of sulfur to melt guarantees typical sulfide distribution, as shown in photomicrograph of longitudinal specimen of EZ MACHINING tool steel.

Sulfur addition to melt held to narrow range in Allegheny Ludlum's EZ MACHINING GRADES

Uniform, finely-distributed sulfides mean uniform machining, uniform high finish, uniform long tool life order after order

Adding sulfur, actually an impurity, to a tool steel melt to make it free-machining must be done with care and precision. That's why Allegheny Ludlum maintains an extremely close average range in adding sulfur to its EZ MACHINING grades. But mere range, however narrow, is not enough. A-L has developed special techniques in adding sulfur and nucleating agents to produce the uniform, finely-distributed sulfides that characterize good free-machining tool steels.

A-L's extra care means you can standardize your machining operations from piece to piece and order to order. This reproducibility is reflected in uniform *machining;* uniform *high finish;* uniform *long tool life.*

For example, in the production of hobs these machining properties in Allegheny Ludlum's EZ MACHINING steels minimize the costly "backing off" operation for back clearance of multiple teeth, eliminating complicated extra heat treatment. Lower residual stresses are set up, because the steel has a lower resistance to the cutting action. Naturally, hobbing is only one of the situations where these free-machining characteristics can benefit you.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

***ALLEGHENY LUDLUM STEEL CORPORATION,** Oliver Building, Pittsburgh 22, Pa. Address Dept. TP-12*

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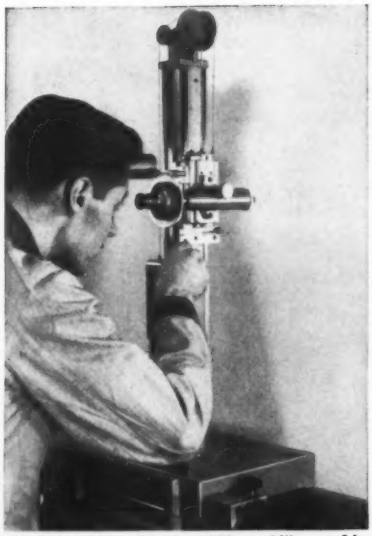
every grade of tool steel... every help in using it

CIRCLE INFORM-A-GRAM KEY NO. 85



M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

Cut inspection time in half

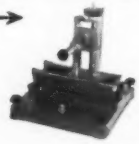
with new Gaertner Coordinate Cathetometers

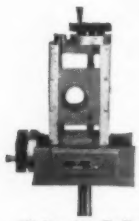
These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

Because these are optical rather than mechanical measuring instruments, you make non-destructive measurements without contact, distortion, or concern about pressure being applied to the object when making a setting. Instruments available in English or Metric system.

M1236-46— Horizontal range 6", vertical range 4". Reads to 0.0001", working distance 5" to infinity.





M1236-22— Range 2" x 2", reads to 0.0001". Working distance 5" to infinity. Shown with 19 mm mounting rod, and without telemicroscope. Instrument permits precise coordinate movement of other objects such as photo cells, probes, etc., in place of telemicroscope.

Write for Bulletin 188-53 & 194-57

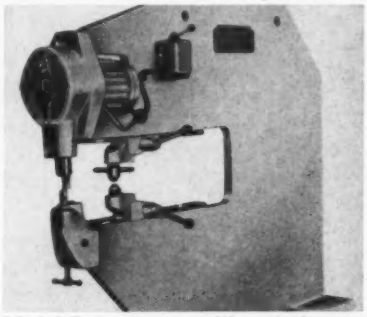
The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335
CIRCLE INFORM-A-GRAM KEY NO. 861

Pressworking

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

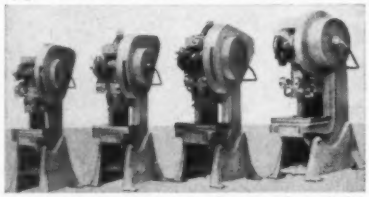
A Small Shearing and Forming Machine for work up to 13 gauge or lighter, is now available from American Pullmax. Ideal for sheet metal and maintenance departments,



Model P-1 operates with a stationary lower tool and a reciprocating upper tool to do many types of cutting, beading, jogging, flanging, and edge-bending. American Pullmax Co., Sheffield & Altgeld Sts., Chicago 14, or — **Circle Inform-A-Gram No. C1**

"Press Primer" illustrates and describes types of WARCO power presses. The 20-page bulletin includes fundamentals of metal press-working with sketches, tables, and charts to help select the right press for the job. Write The Federal Machine and Welder Co., Warren, Ohio, for a copy of Bulletin 52151, or — **Circle Inform-A-Gram No. C2**

Air Friction Clutches and welded steel construction are features of a complete line of 25 to 200 ton capacity OBI presses. The low inertia type clutch results in less wear be-



cause of the low number and weight to be picked up on clutch engagement. Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, or — **Circle No. C3**

Dies for Bending and forming the various alloy sheets and plates used in aircraft, missiles, and rockets are presented in a bulletin. These dies are made of high quality carbon steel with the forming edges provided with a superfine finish to avoid marring the surface. Specifications are given in Bulletin AFD-959, available from Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, or — **Circle No. C4**

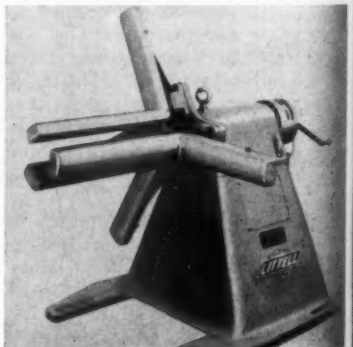
A Lightweight, Inexpensive Bench Shear, Model 39, that will cut flats, angle iron, rounds, and bar stock without changing dies or cutting blades, is outlined in a bulletin. Information includes mild steel capacities, features, and dimensions. Get your copy from Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill., or — **Circle No. C5**

Quick and Accurate Cold-Heading of miniature parts is possible with the new Omega 00 machine that handles electrical contacts, rivets, and other parts as small as 0.012" dia x 0.016" long. It will cut to

length, head, and form between 80 and 120 pcs/min to close tolerances. The Robert E. Morris Co., 5004 Farmington Ave., W. Hartford, Conn., or — **Circle Inform-A-Gram No. C6**

Function and Operating Characteristics of two new manually-controlled C-Frame presses are explained in a catalog. Dimensional and application data, accessories, and operating controls are covered. Get Bulletin 58-CPM from The Hydraulic Press Mfg. Co., A Div'n of Koehring Co., Mt. Gilead, Ohio, or — **Circle Inform-A-Gram No. C7**

A Line of Automatic-Centering Three-Arm Reels for heavy coils of copper, bronze, brass, and tin plate stock have been announced by F. J. Littell Machine Co., 4101 N. Ravenswood Ave., Chicago 13. They hold



up to 4,000-lb-coils, 45" maximum OD and 18" maximum width. Minimum ID is 8½". For information, contact the company, or — **No. C8**

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Ideal for tool room sawing, trimming castings or friction sawing steel and other metals formed or flat . . . the most versatile, efficient and best built machine in the field. Note these new features:

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The Inform-A-Gram card which follows page 84 is for your convenience in making inquiries about advertised Products and Editorial items.

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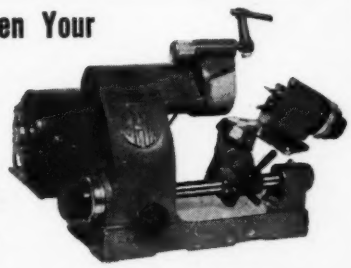

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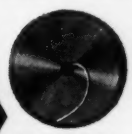

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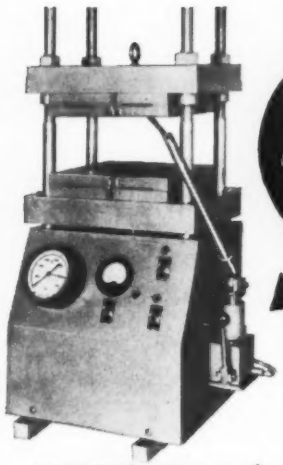

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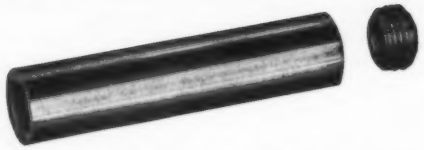
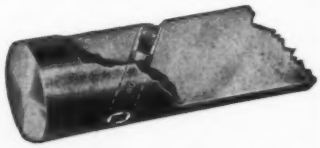


One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.



The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

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ARMSTRONG
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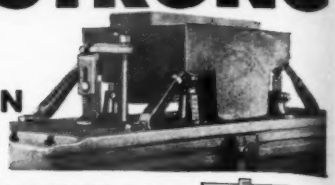

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

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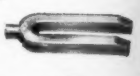

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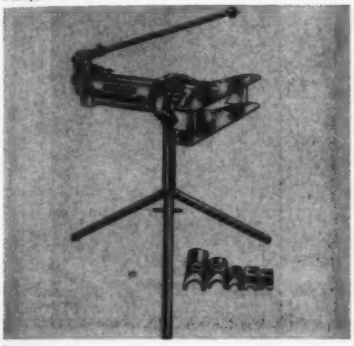

hydraulic or reverse pressure systems. For information, write Wharton Unitools, P. O. Box 202, Valley Stream, L. I., N. Y., or — **C10**

A Two-Speed Clutch increases output of a 600-ton eccentric press. This feature permits three operational speeds and takes advantage of the maximum approach and return

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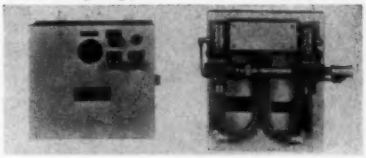
Equipment For the Special Forming and deep drawing of intricate light and heavy metal stampings is discussed in an illustrated bulletin. The means of obtaining the exacting tolerances, strength, and surface finishes are related. Copies of the bulletin are issued by The Reichert Float & Mfg. Co., 2325 Smead Ave., Toledo 6, or — **Circle No C12**

A Fail-Safe, Anti-Repeat Control System, featuring dual interlock but independent pneumatic-electrical-mechanical circuits, has been announced by Textrol, Inc., 4015 Pro-

Pressworking

PRODUCTS & PROCESSES & PRODUCTS

spect Ave., Cleveland 15. With the Andrus-Coon press control, accidental repeat operation on single cycling machines is almost impossible. It's suitable for use on presses, brakes, and shears. For details, write the company, or — **Circle C13**



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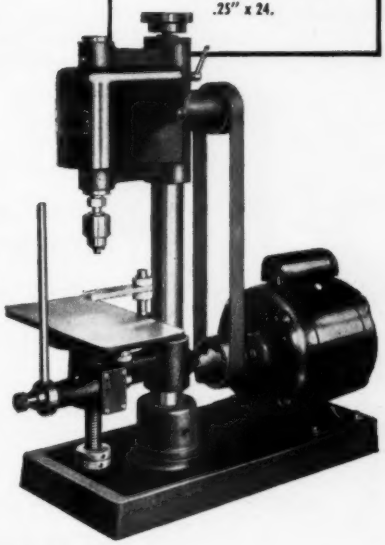

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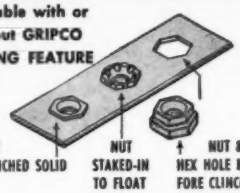

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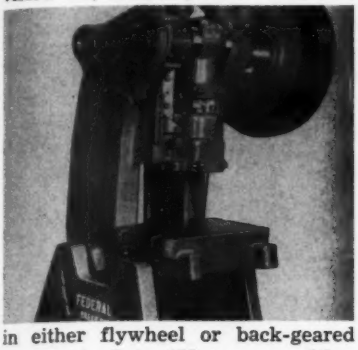
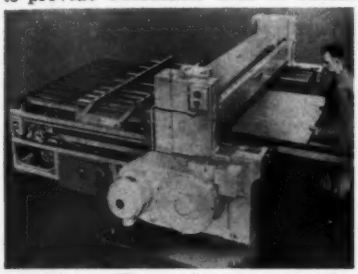
One-Piece Cast Iron Frames of high tensile strength are featured on the new line of OBI presses announced by The Federal Press Co., Division St., Elkhart, Ind. Available



in either flywheel or back-geared models, in 7 to 100 ton capacities. For details, write the company, or— **Circle Inform-A-Gram No. C14**

This Shear-Pacer Unit automatically gages and feeds sheet, coil, or strip from standard square shears to provide automatic trim or cutoff



operations. The unit advances the sheet to gaging fingers, cuts it, and carries it to a stacking unit. Press Automation Systems, Inc., 25418 Ryan Rd., Centerline, Mich., or — **C15**

Two New Draw Shell Trimming Machines can trim draw shells up to 16″ dia, together with the new multiple spindle unit that handles 6″ drawn shells, up to a production of

3600 shells/hr. For more information, write Dayton Rogers Mfg. Co., 2824 13th Ave. S., Minneapolis 7, or — **Circle Inform-A-Gram No. C16**

Two- to 85-Ton Capacity Press-Rite OBI Presses are fully described in a bulletin which gives specifications and descriptions of features and optional equipment. For your copy of Bulletin 958, write to Sales Service Mfg. Co., 2365 University Ave., St. Paul 14, or — **No. C17**

Extra Long or Heavy Work can be handled by the horizontal presses described in a bulletin released by Dake Corp., Robbins Rd., Grand Haven, Mich. Specifications and features of these presses, which range in capacity from 25 to 60 tons are also included. Get a copy of Catalog 410 from the company, or — **C18**

Finger Tip Controls make the operation of the new 9″ and 10″ dia plate bending rolls easy. These machines were developed to turn out commercially true cylinders and can handle metal plate up to ¾″ thick. Complete, instant control of forward and reverse rotation of the rolls is possible. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, or — **Circle No. C19**

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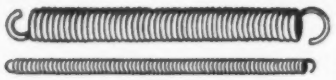

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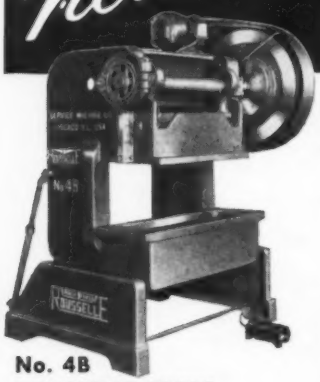

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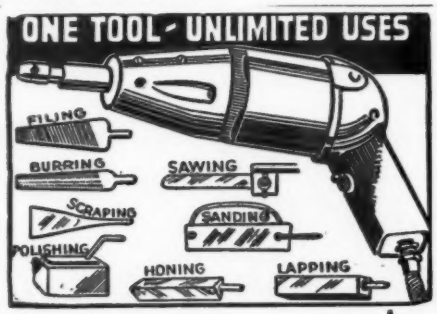

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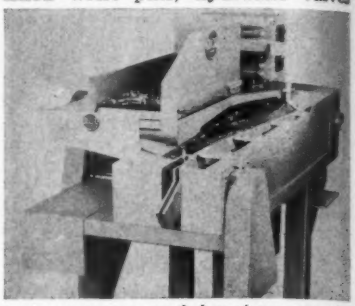

and plungers, and bearings can be moved at speeds up to 30,000 pcs/hr. Radio Corp. of America, Industrial Automation Equipment, 12605 Arnold Ave., Detroit 39, or — D1

"High Frequency Induction Heating Equipment" is the title of a bulletin which gives information on heat stations and generator control units, and application photos and data on heat treating, annealing, brazing, forging, and shrink fitting. Write to Magnethermic Corp., 3990 Simon Rd., Youngstown 7, for your copy of Bulletin HF-58-6, or — D2

Individual Spindle Torque Control is a feature of the new high-production multiple-spindle screwdriver. Used for high production screw fas-

tening or small parts, the machine also features pneumatic-electric operation. Gray Equipment Co., 13600 Ford Rd., Dearborn, Mich., or — **Circle Inform-A-Gram No. D3**

Strippit Pierce Nut Units for staking Fabristeel nuts into sheet metal for assembly panel production, are completely described in a bulletin. Operation and specifications of the press-actuated Types CK and BL units for short, medium, and long runs are covered. Write Wales-Strippit, Inc., 212 S. Buell Rd., Akron, N.Y., for copies of this Bulletin, or — **Circle No. D4**

For Light Assembly Operations, use the cam lever action press-type bench welder that's easy to operate and is flexible. Model R-600 hand-operated spot welder is good on mild or stainless steel through 26 gauge and cross-wire welds through two pieces of 3/16" clean steel wire. Peer, Inc., 1200-1248 Milton St., Benton Harbor, Mich., or — **Circle Inform-A-Gram No. D5**

Material Handling Conveyors and conveyor systems are described in a bulletin which gives their advantages and features. Different Unibilt systems for specific jobs are pictured and discussed. Get your copy of Bulletin LC858 from Conveyor Specialty Co., Inc., 33 Newport Ave., N. Quincy 71, Mass., or— **D6**

Automatic Assembly of Small Parts can be done with the Auto-Positioner, discussed in a bulletin. Various models and arrangements of equipment, and examples of parts being handled, are pictured and explained. Get Bulletin AP-B2 from Dixon Automatic Tool, Inc., 2300 23rd Ave., Rockford, Ill., or — **D7**

A New Rotary Type Parts Feeder uses rollers to feed the product so that it's almost impossible for a part to jam in the discharge track. Hoppermatic Model R handles nails,

screws, rivets and tablets, and very quickly changes over from one size or shape to another. U. S. Engineering Co., 40-24 22nd St., Long Island City 1, N. Y., or — **Circle No. D8**

Tau Bolt Fasteners for blind applications are covered in a bulletin that gives specifications and dimensional drawings of the protruding head and the countersunk type. To get more information, write to Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, for Bulletin 8-389, or — **D9**

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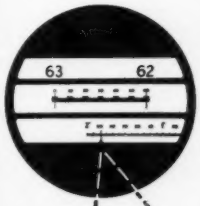

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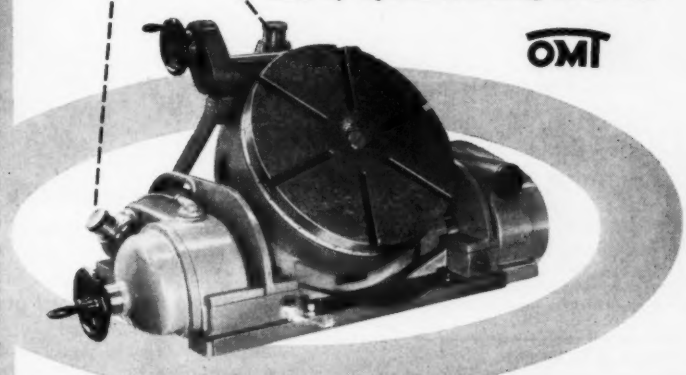

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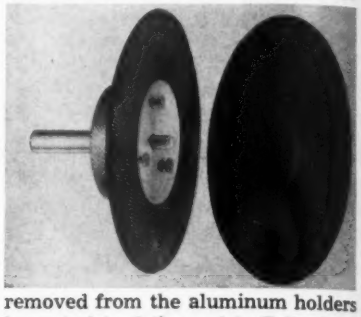
"Diamond Wheels" is a 43-page catalog which introduces Elgin's expanded diamond line. The new identification code for diamond wheel shapes is pictured and an outline of how, where, and when to use these diamond wheels is also given. Included are diagrams and specifications of available wheel types. Write to Elgin National Watch Co., Elgin, Ill., or — **Circle No. E1**

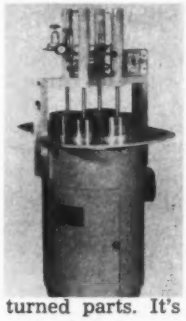
A Bench Model Flat Tapping Machine incorporates many features of larger automatics. The Gyro-Matic 12″ model operates with work holder retainer rings, which retain and guide workpieces for best lapping action. Get information from Spitfire Tool & Machine Co., 2831 N. Pulaski Rd., Chicago 41, or — **Circle Inform-A-Gram No. E2**

Solve Your Bore-Sizing Problems with the help of a "Typical Applications" booklet which highlights 99 honing jobs, listing production rates, size, tolerance, stock removal, and finish data on parts from ⅛″ to 2¾″ ID. Among the parts are those with keyways, splines, and blind holes. Get your copy from Sunnen Products Co., 7910 Manchester Ave., St. Louis 17, or — **Circle No. E3**

High-Speed "Contour" Flexible Abrasive Discs and locking holders are for maximum operating speeds to 90,000 rpm, according to size. The discs can be attached or



removed from the aluminum holders by a twist of the wrist. Grits from 24 to 320 and sizes from ¾″ to 4″ dia are available. Foster Supplies Co., 6122 Milwaukee Ave., Chicago 46, or — **Circle No. E4**



A Manually-Operated Air System is now an optional feature on the Speedlap 18 machine. It laps carbides, ceramics, and hardened steels, and sintered, cast, stamped, or turned parts. It's ideal for aircraft and missile parts. Abrading Systems Co., 8020 N. Monticello, Skokie, Ill., or — **Circle Inform-A-Gram No. E5**

Disc Grinding is virtually automatic with the new Besly-Welles double horizontal spindle disc grinder that features simplified push-button operation, accuracy to 0.0001″, automatic dressing and sizing, and the sealed quill construction for highly sensitive feed control. Model DH4 economically grinds parts and materials like bearing races, gear blanks, valve plates, and steel, cast iron, carbides, and ceramics. A few or all the features may be incorporated in the machine to suit special requirements. Get Bulletin DH4 from Besly-Welles Corp., 120 Dearborn Ave., S. Beloit, Ill., or — **No. E6**

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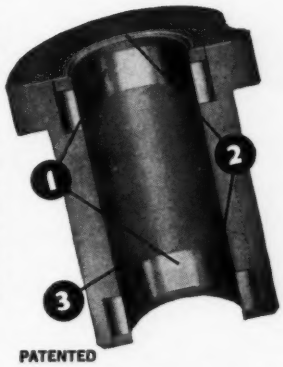

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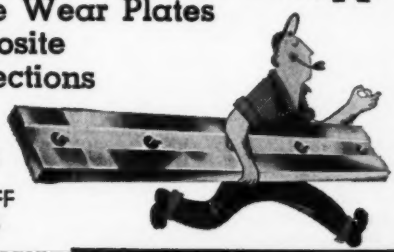

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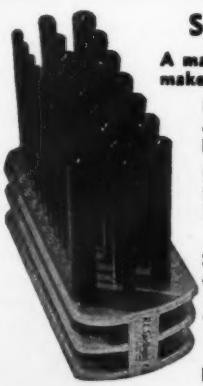

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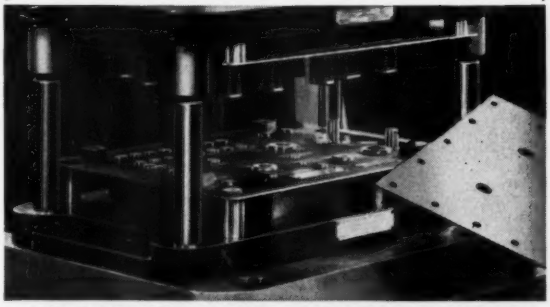

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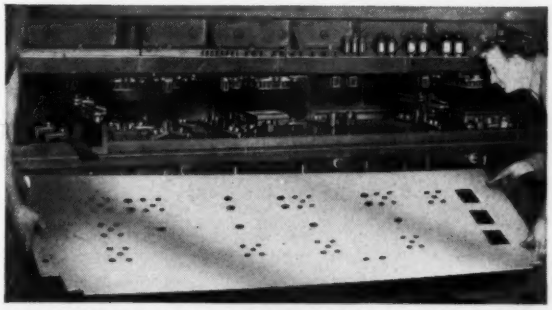

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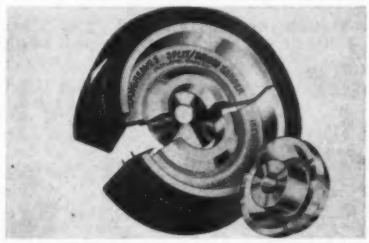
CIRCLE INFORM-A-GRAM KEY NO. 954

Grinding & Finishing

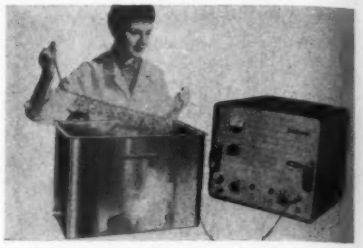
PRODUCTS & PROCESSES & PRODUCTS

Depressed Center Abrasive Wheels for weld grinding and general off-hand use on portable disc-type sanders and right angle grinders, are discussed in a bulletin. The Double XX wheel is a rigid-type resinoid bond, double reinforced for extra strength. Get Bulletin ESA-244 from Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, for specifications, or — **Circle No. E7**

Use Low Cost Strips of coated abrasive in this split drum sander. The Split/Drum sander has no hinge and the locking cone is a part of the arbor bushing, eliminating the need for a backing flange. This sander is available in a 6" model from Hargreaves Industrial, 120 N. W. 9th Ave., Portland 9, Ore., or — **E8**



Large-Volume Cleaning Operations can be handled by the new Series 5000 Narda SonBlaster ultrasonic cleaner. The generator is equipped with tank and load selector switches so it'll operate either one or two ultrasonic tanks alternately, or submersible transducers in up to 30-gal tanks. The Narda Ultrasonics Corp., 625 Main St., Westbury, L.I., N. Y., or — **Circle No. E9**



A New 6" x 60" Hand-Stroke Belt Sander is outlined in a catalog sheet from Boice-Crane Co., 963 W. Central Ave., Toledo 6, Ohio. New features described and illustrated include a machine tool type base, anti-friction bearings, free-rolling worktable, and floating motor-mount. Get a copy from the company, or — **Circle No. E10**

Plain Cylinder Grinders, the Landis 10" Type DCH and 14" type LDCH are described in a bulletin which shows a typical example of how automation and work setups with an extra wide wheel or spaced wheels can be applied to this grinder. Specifications are given in Bulletin CD-58 released by Landis Tool Co., Waynesboro, Pa., or — **E11**

Power Tools for cutting, shaping, drilling, and finishing are fully discussed in a 51-page catalog which gives specifications, construction features, and operational data on band saws, lathes, planers, drill presses, and other tools. Write to Boice-Crane Co., 963 W. Central Ave., Toledo 6, for catalog 59, or — **Circle Inform-A-Gram No. E12**

Solve Dust Control Problems with this bulletin which contains information on equipment for all types of jobs. Specifications, features, and applications are given for Flexaust hose and the Portovernt duct. Bulletin 82 is available from The Flexaust Co., Div'n of Callahan Zinc-Lead Co., Inc., 100 Park Ave, New York 17, or — **Circle No. E13**

Johnson Model J ... A big, rugged saw that cuts anything—anywhere! 10" rounds, 18" flats, heavy structurals and odd shapes. Available in wet or dry cutting models, variable speed drive and optional equipment.

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Remember... Johnson offers three husky, handsome models that'll do the job faster, better. They're beautifully engineered, semi-automatic, have centralized controls—plus many exclusive features that pay production dividends to *you!*

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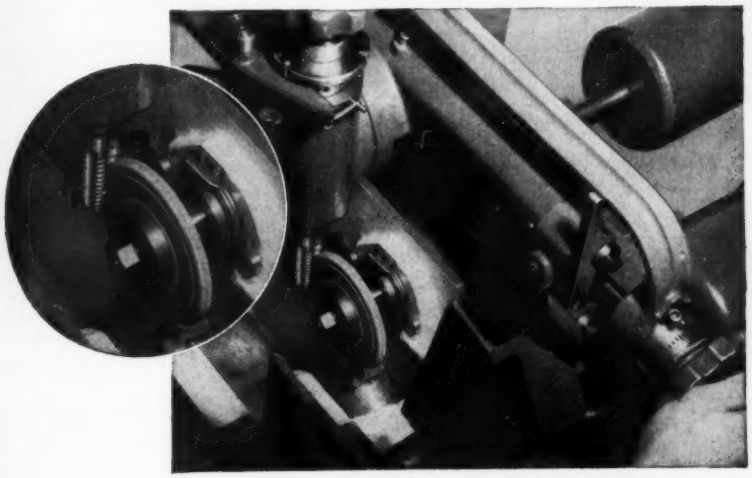

Keep it sharp — Make 1 tap do the work of 6 with The Blake Flute Grinder.

This accuracy will result in uniformity of hole, much longer life for your taps and a surprising savings in tap costs.

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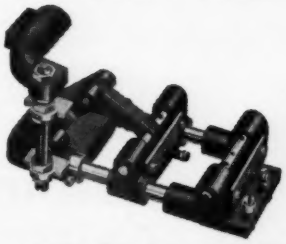
CIRCLE INFORM-A-GRAM KEY NO. 973

A SURE FEED



PRODUCTO AUTOMATIC "SUREFEED"

Your pressroom can produce more with this compact, durable stock feed. Can be mounted right on die set to save you time. Direct linkage feeding affords greater accuracy. Comes in 2" and 3" sizes. Write for detailed bulletin on this cost-cutter.

THE PRODUCTO MACHINE CO.
970 Housatonic Avenue
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CAMS ALL TYPES MADE TO YOUR SPECS

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730 SO. 13TH ST. NEWARK 3, N. J.

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Offer 4-Point SUPERIORITY Over Springs, Rubber Bumpers

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Adjustable compression provides ideal blank holding pressure.

2
Bronze bearing surfaces give maximum stability.

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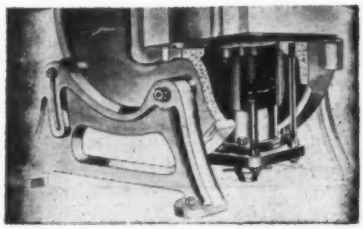
Constant pressure assures equal loading at start and finish of draw.



Full Universal Pneumatic Die Cushion

4
Simple mounting, either bolster or press bed. More stable installation possible due to method of suspension.

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the only Single Tube Balanced System

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SCREW MACHINE TOOLS!

CUTTING CAMS
HIGH SPEED STEEL AND CARBIDE FORM TOOLS
SPECIAL CUTTING TOOLS
SPLIT DRILL BUSHINGS
CROSS SLIDE KNURL HOLDERS
TOOL BITS
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Standard sizes 00, 0, 2, carried in stock.

We specialize in one thing only . . . designing and making SCREW MACHINE TOOLS!

47 years experience goes into every tool we make. They come to you ready for use . . . Precision design . . . Skilled workmanship . . . Finest materials.

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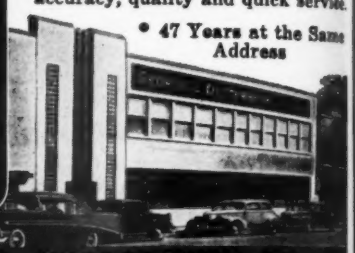
• 47 Years at the Same Address



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1871 Clybourn Avenue • Chicago, Illinois

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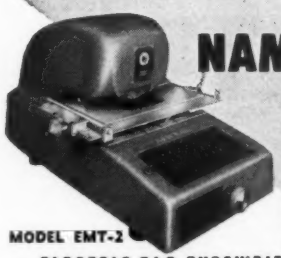
CUT PRODUCTION COSTS!
MARK NAME PLATES 5 TIMES FASTER



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ELECTRIC TAG TYPEWRITER
A touch of the finger delivers up to 2 tons pressure for deep, legible impressions in metal or plastic tags.

—WITH—
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HI-SPEED
TAG MARKING MACHINE
Automatically marks BOTH constant and serial numbers at any desired speed up to 8,000 tags per hour!

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Some Territories Still Available
Send Now for Bulletin

DEFIANCE MACHINE & TOOL COMPANY
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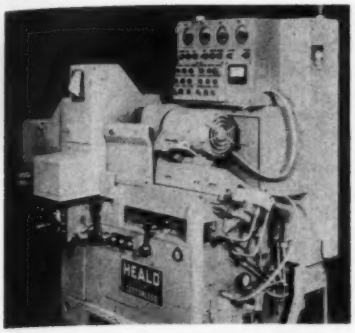
CIRCLE INFORM-A-GRAM KEY NO. 984

This Roll-Type Centerless Internal Grinder is one of the two new Heald models which feature the Rite Angle design. The table is inclined at a 30° angle to the work, preventing the tendency to lift when



the work is fed into the wheel. Model 180A is for small and medium size work and can be rotated on its own OD. The Heald Machine Co., 2 New Bond St., Worcester 6, or —

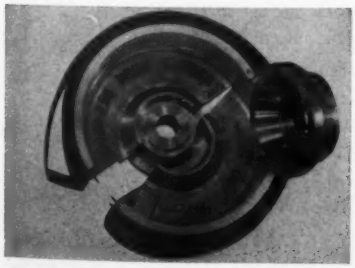
Circle Inform-A-Gram No. E14

An Air-Cooled Metal Center Buff, Red-D-Vent, is highlighted in a bulletin. The buff features a new metal center which allows cooler running and longer life. Specifications and a cross-section showing the full construction of the buff are included in the folder introduced by Divine Brothers Co., Seward Ave., Utica, N. Y., or — **Circle E15**

"Electrolytic Metal Removal" is a bulletin which explains the process and equipment. A diagram shows how the process works, and several models of precision spindles that can be used for electrolytic applications are shown. Write to The Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati 4, or —

Circle Inform-A-Gram No. E16

Shape High Speed Tool Bits on the Cone-Loc drum sander, which uses strips of coated abrasive. This combination reduces heating and quickly removes material. The ma-



chine is available in 4", 6", 8", 10", and 12" dia, with standard rubber cushion. Get details from American Diamond Saw Co., 1721 N. E. 38th Ave., Portland 12, Ore., or — **E17**

Abrasive Papers and Cloths are presented in a bulletin from United Mineral & Chemical Corp., 16 Hudson St., New York 13. Technical information is given for sheets, rolls, belts, and discs. Specifications and suggested combinations for specific applications are included. Get a copy from the company, or — **E18**

A Barrel Finishing Machine announced in a bulletin by Casalbi Co., 540 Wayne St., Jackson, Mich., is used for deburring, grinding, radiusing edges, descaling after heat treat, burnishing, and polishing.

Grinding & Finishing

PRODUCTS & PROCESSES & PRODUCTS

Specifications and features are given for Model RD/2 in this bulletin, offered by the company, or —

Circle Inform-A-Gram No. E19

"Precision Flatness Black Granite Surface Plates" is a bulletin which tells how they are made, materials used, and how they are inspected. Advantages of these products are given in this bulletin, available from Accurite Surface Plate Co., 4661 Alger St., Los Angeles 39, or — **E20**

Another Buck "First" for You

Buck Gibbed Keyway Ajust-Tru® Power Chuck with Aluminum Body

★ .001" Precision

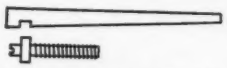
★ Gibs Take Up Wear

★ 40% Weight Saving

★ All Working Surfaces Hardened, Ground, Lubricated

★ All Ajust-Tru Features

★ Available in 6½", 8¼", 10", 12", 15"



Simple, sound, practical! Two tapered gibs under each jaw, working on tapered keyways, can be tightened to preserve original accuracy and eliminate the jaw rocking that develops "bell-mouthing." Jaws are 40% lighter for less centrifugal effect, better gripping at high speeds. One piece hardened front plate eliminates distortion, can be reground in your own shop.

You'll agree when you see it and use it—Buck has made chuck history again with this new gibbed keyway power chuck with aluminum body.

Wear take-up features will *triple* its useful *precision* life, compared with conventional chucks. 40% weight saving increases efficiency and cuts machine wear.

Send for complete details. More than ever—"It pays to chuck with Buck."

BUCK TOOL COMPANY

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Many special production tools are costly to manufacture, and when properly hardened become invaluable in service. Do you run the risks of uncertain heat treating on your important tools?

Sentry quality-controlled heat treating is sure. Once a hardening cycle is established results are automatic with every charge.

The unvarying neutral Sentry Diamond Block atmosphere positively protects all steels from scale or decarburization above 1700°F. Without danger of surface spoilage, tools may be subjected to any soak necessary for true hardness. Even sharpest cutting edges are accurately maintained.

You will be pleased to know what Sentry can do for you. May we be priviledged to demonstrate on samples of your high speed tools?

Sentry ELECTRIC FURNACES
TRADEMARK

Request Catalog Z-43 • Write THE SENTRY CO., FOXBORO, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 1001

Smoother Production! Higher Output! Lower Costs!

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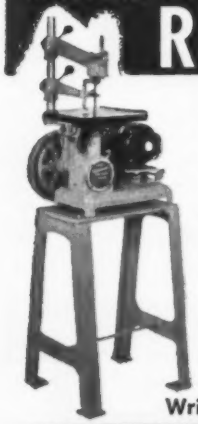


DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY

228 PARK AVENUE BELGIUM WISCONSIN

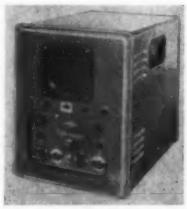
CIRCLE INFORM-A-GRAM KEY NO. 1002

Q-C and Inspection

PRODUCTS & PROCESSES & PRODUCTS

Diatest High Precision Small Bore Gages now range from 0.057" to 1.130" and are accurate to within 0.00008". Four sets of gages provide an overlap in size to assure complete

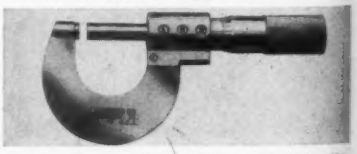
range. Right angle attachments, extension rods, and depth adjusters are also available from Foster Supplies Co., 612 Milwaukee Ave., Chicago 46, or — **Circle No. F1**



An Ultrasonic Inspection Instrument, Reflectoscope, Model UR-600, has great sensitivity for locating surface and internal defects. A variable pulse repetition rate facilitates high speed scanning of small parts and the unit may be used for both contact and immersion testing with one or two search unit techniques. Sperry Products, Inc., Shelter Rock Rd., Danbury, Conn., or — **F2**

These Compact, Light Johansson Micrometers are available in 0.001" to 0.0001" graduations and feature a solid bronze inner sleeve to eliminate friction between spindle and sleeve, resulting in smoother operation and longer life. MG Tool Co., 80 White St., New York 13, or **Circle No. F3**

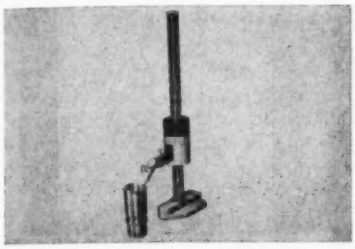
This Simple, Direct-Reading Micrometer speeds production and inspection because readings are taken from the counter-type dial without



need for calculation. Speedmike speeds readings and reduces errors. Get details from J. T. Slocomb Co., S. Glastonbury, Conn., or — **F4**

No Setting Masters or gage blocks are needed with this dial indicator checker and self mastering comparator. The portable Go-Devil Monitor checks to an accuracy of 0.000025″ and can be used in inspection departments, and toolrooms. Get more information from Go-Devil Instrument Co., 624 Dutchess Tpk, Poughkeepsie, N. Y., or — **Circle No. F5**

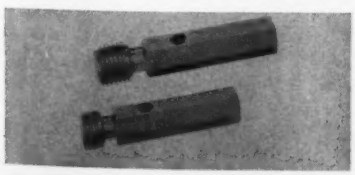
A New Height Gage features an easily read micrometer scale from which readings to thousandths and ten thousandths can be made. These units range up to 120″ high with



accuracies within 0.000050″. They combine height checking and height measuring functions in one unit. The Challenge Machinery Co., Grand Haven, Mich, or — **Circle No. F6**

A Pocket Conversion Chart converts micro-inches to small angles (from 1 sec to 1 min) to micro-inches per inch, per 10″, and per foot. It also converts linear measure from one micro-inch to 0.005″ in terms of minutes, seconds, and fractional seconds, per inch, per 10″, and per foot. Get one from Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or — **Circle Inform-A-Gram No. F7**

Two to Five Times Longer Life due to increased wear and abrasion resistance is a feature of the new Black Diamond thread plug gages.



They're available from #0 to 1½″. For additional information, write to Threadwell Tap & Die Co., Greenfield, Mass., or — **Circle No. F8**

sure/bore

"Package Plan"

offers...

★ CONVENIENCE
★ EFFICIENCY
★ ECONOMY

NEW PACKAGE PLAN INCLUDES:

Boring Bar "4–some Package"...
4 Boring Bars from 7/8″ to1-3/4″ dia., with Micrometer adjustment. Tool Bit mounted at 53° or 90° angle. Boring range from 1″ to 3-1/8″ dia.

Sure-Bore Cartridge "Package"...
"53" or "90" pack includes 3 complete assemblies, cartridges, carbide tool bits, wrenches.

Boring Head "2–some Package"...
includes a 2″ and 3″ head, 2 long and 2 short tool bits... Boring range 2-3/4″ to 5-1/4″ dia.

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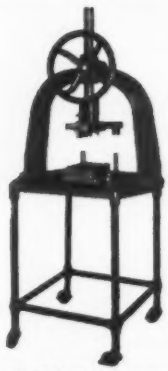

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Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the die-maker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

Sole Distributors

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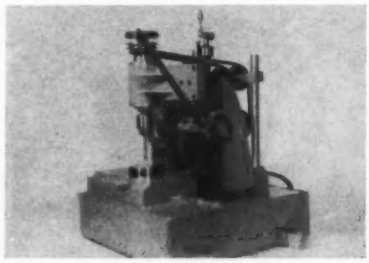
Machining

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

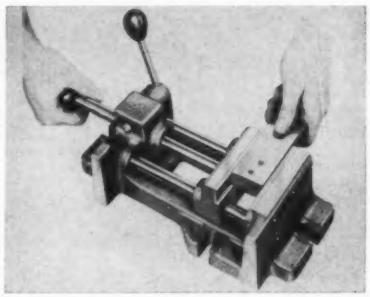
Way-Type Precision Boring Machines, designed on the building block principle to facilitate changes in production requirements, are discussed in a bulletin. Described are 1-, 2-, 3-, and 4-way types. Illustrations show applications. Bulletin 312081 is available from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or — **Circle No. G1**

For Small Precision Drilling where the drill has to be held very accurately in a collet, use the new Derbyshire drill press. Dimensions include 3½" throat depth, 4" height



from top of table to headstock, and 15" maximum height from table to top of column. F. W. Derbyshire, Inc., 157 High St., Waltham 54, Mass., or — **Circle No. G2**

A Redesigned Vise allows machining from two sides. Model 4-GM has sturdier construction and

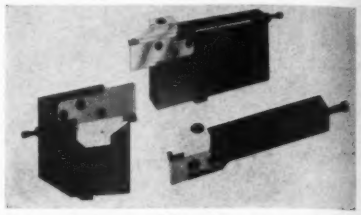


4" jaw width, and is made with two types of locking mechanisms. For details, write Heinrich Tools, Inc., Racine, Wis., or — **Circle No. G3**

More Accurate Boring, recessing, grooving, and back-facing are possible with this new universal lathe slide head. Designed for easy, precision use, its hairline adjustment of cutting tools is done by the screw and dial principle. This head is ideal for medium runs of either rough or finish work. G/K Products, 9548 Gidley St, Rosemead 38, Calif., or— **Circle Inform-A-Gram No. G4**

→

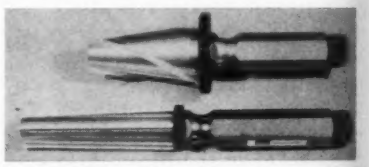
The Manchester Carbide Cut-Off Tool Line includes holders for any cut-off machine, turret lathe, engine lathe, or automatic. A patented "V" blade support assures accurate loca-



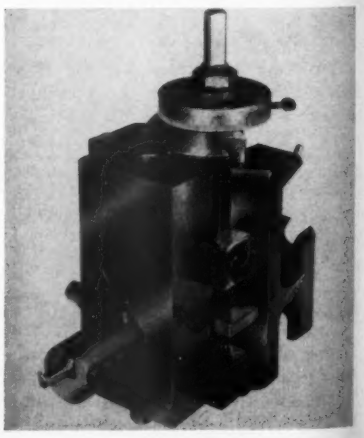
tion of the carbide insert, and because it's always on center, it won't "lead-off" during cutting. Portage Double Quick, Inc., 1046 Sweitzer Ave., Akron 11, Ohio, or — **No. G5**

Cost-Cutting Features of the Edlund Model 1F high speed sensitive drilling machine are presented in an 8-page bulletin. It gives specifications, applications, and dimensional drawings of various models and accessories. Contact Edlund Machinery Co., 50 Huntington St., Cortland, N. Y., for Bulletin 160R, or — **G6**

Keep Machine Tool Spindles Clean to assure greater work accuracy in toolrooms and production lines by using this line of socket hole cleaners for tapered and



straight holes. They're lightweight and safe, and are available in many sizes. Scully-Jones Co., 1901 S. Rockwell St., Chicago 8, or — **No. G7**



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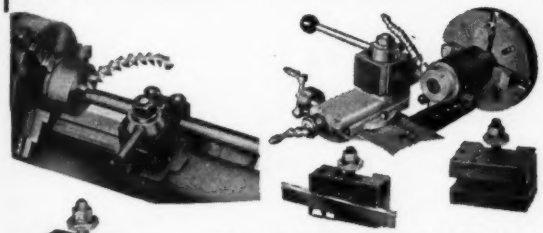
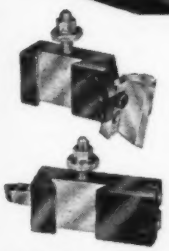
FOR MAXIMUM VERSATILITY & RIGIDITY





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cuts standard, tapered keyways ¼" to 2" wide

- fast set-up—saves time and money
- low cost operation-uses standard tool bits
- heavy-duty hydraulic circuit—assures accurate keyways
- compact, 21" x 61"—no special foundation

Send for Bulletin 34

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- √ Torsion Bars
- √ Diodes
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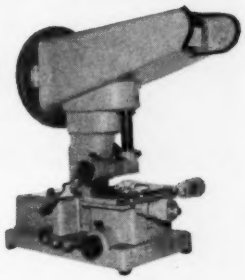

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Machining

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Quickly Analyze and Compare Metal cleaning costs, using the new booklet issued by the Du Pont Electrochemicals Dept., E. I. Du Pont de Nemours & Co. (Inc.), Wilmington 98, Dela. By using your figures in the simple formula, total hourly cleaning costs can be obtained so that economical systems or adjustments can be made. Get this booklet from the company, or — **Circle Inform-A-Gram No. G8**

This Tap Holder combines precise ball bearing length compensation, non-friction torque, axially parallel float, and the unique fast change feature, which enables tap sizes or

taps to be changed without tools, with one hand, and eliminates any shank alterations to the tap. T. M. Smith Tool Co., 14644 Puritan Ave., Detroit 27, or — **Circle No. G9**

Increase Production and extend tool life using the helix point drills, as produced on the Steptool relief grinding fixture, highlighted in a bulletin. It covers two performance case histories and tells how it sharpens core drills, stepdrills, countersinks, and taps. Write Steptool Corp., 3613 E. Olympic Blvd., Los Angeles 23, or — **Circle No. G10**

Automatically Control Machine Tools with this Bendix numerical control system which saves production lead time because no templates, cams, or models are required, and fixturing can be simplified when

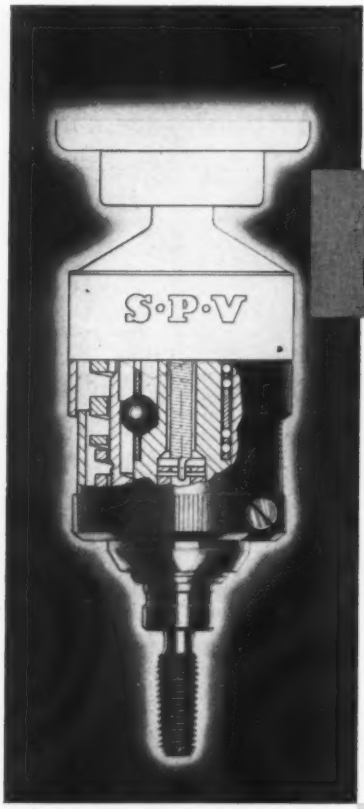
producing parts such as cams, forging dies, molds, and forged fittings on milling, turning, jig boring, and drilling machines. Bendix Industrial Controls Section, Bendix Aviation Corp., 21820 Wyoming Ave., Detroit 37, will give details. **Circle No. G11**

"Special Cutting Tools" are discussed in a bulletin which also shows how extra operations can be eliminated by using these Spiral tools. Methods of producing and resharpening the various tools are pictured and explained. Get this bulletin from Spiral Step Tool Co., 5400 N. Damen Ave., Chicago 25, or — **Circle Inform-A-Gram No. G12**

This Heavy-Duty Drill Press Air Feed attachment was designed for automatic or semi-automatic precision control of spindle feed and retraction on standard single- and multiple-spindle drilling machines.

Easily installed, it handles up to 2,000 lbs total drill point pressure. Renco-Aire, A Div'n of Cleveland Pneumatic Industries, Inc., 64 Old Orchard, Skokie, Ill., or — G13

A new 15" Lathe is described in a bulletin from Sheldon Machine Co., Inc., 4258 N. Knox Ave., Chicago 41. The low cost lathe fills the gap between geared-head and belt-driven lathes. Get details and specifications from the company, or — G14



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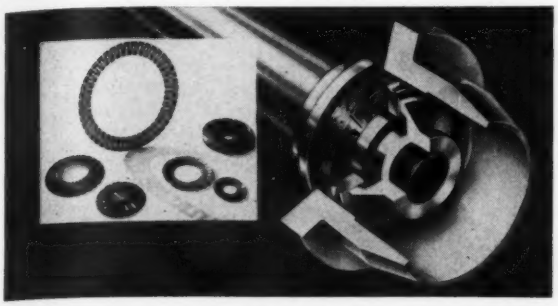

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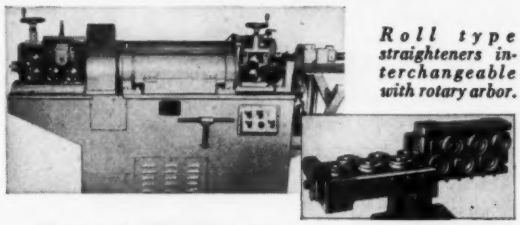

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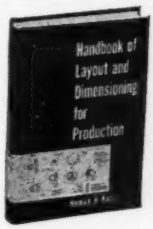

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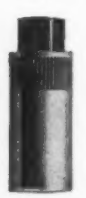
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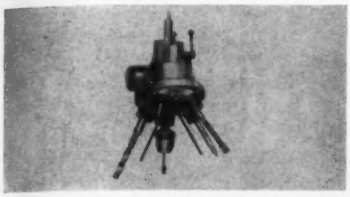
"Printed Circuit Drilling" is a new bulletin which describes applications and equipment for making holes in printed circuit panels. Specifications are given for several models of multiple spindle units. Get your copy of Bulletin 858 from Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, or — **Circle No. G15**

Convert Any Vertical Single-Spindle Drill Press into a multi-spindle machine using the ARBO-3 automatic revolving and indexing drill head that takes two to five



tools at one time. Drilling capacity is ⅛" to 1"; tapping capacity is ⅛" to 15/16". Jersey Mfg. Co., 456 Livingston St., Elizabeth, N. J., or — **Circle Inform-A-Gram No. G16**

Carboloy Cemented Carbide Cutting Tool Material information and new pricing systems are presented in a new catalog from the Metallurgical Products Dept., General Electric Co., 11177 E. 8-Mile Rd., Detroit. Positive and negative rake toolholders, Carboloy cemented carbide tools, tool bits, and inserts are listed. Contact the company for a copy, or — **Circle No. G17**

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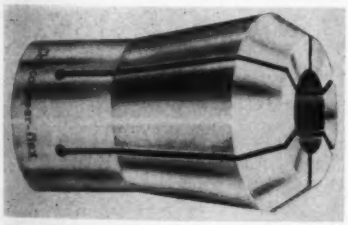

from ⅛" to 2½" in 1/32" increments. Good concentricity in all degrees of light- through heavy-cutting is possible. Chi-Co., Inc., Ledge Rd., Northfield, Ohio, or — **Circle G18**

An Air Vise Line for automatic, self-centering operations, with 0.001" tolerances, and holding power up to 4,000 lbs at 100 psi, is described in a bulletin. Specifications are given for the different models. Write to Heinrich Tools Inc., Racine, Wis., for a copy, or — **Circle No. G19**

If you're interested in new tooling methods and applications, an 11-min strip film shows the design, construction, and application of high precision boring heads. Designed around the patented Briney principle, these boring heads can be adjusted in increments smaller than 0.0001" without loosening or tightening any screws. The film is available from Briney Mfg. Co., 1165 Seba Rd., Pontiac, Mich.

Machining

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For Easier One-Hand Control, use this floating plate for moving heavy drill jigs on the table of multiple-spindle drill presses. Model C also is ideal for easy positioning of

heavy parts on other types of equipment. Centerline Engineering Co., 90 Crest St., Wethersfield, Conn., or — **Circle Inform-A-Gram No. G20**

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Machining

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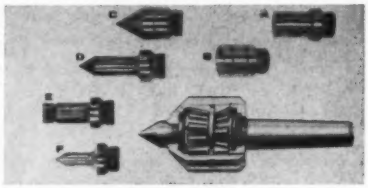
Precision Fabrication Facilities are described in a catalog from United States Chemical Milling Corp., 1700 Rosecrans Ave., Manhattan Beach, Calif. Metalworking and chemical milling facilities are now both available from them for users of metal structures and systems who have design and production problems. Ask the company for a copy, or — **Circle Inform-A-Gram No. G21**

Tool Up With Less Expense using the new heavy-duty Trio live center and making your own special replaceable center points. By changing center points, this tool can be used for many different special or short-run production jobs involving castings, bars, tubing, pipe, or forgings. Trio Machine & Mfg. Co., 35700 Vine St., Willoughy, Ohio, or — **Circle Inform-A-Gram No. G22**



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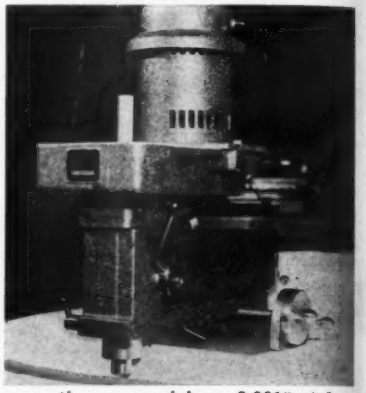
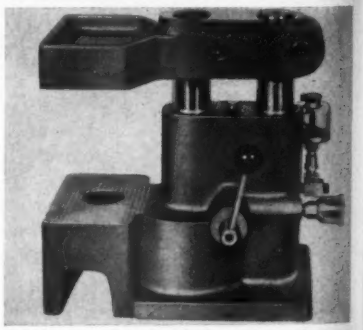
Accuracy, Economy, and Simplicity are some of the advantages of Model VM 215-3 broaching machine, discussed in a bulletin. Capacities, speeds, and other data are given along with operational features. Pioneer Broach Co., 6434 Telegraph Rd., Los Angeles 22, supplies copies of the bulletin, or — **Circle No. G23**

This Precision Tool, a cross between a portable magnetic base drill press and pedestal-type miller, is capable of performing light boring



operations requiring 0.001" tolerances. The DMT unit has a longitudinal slide and cross ram, both with tapered gibs and graduated lead screws. Drill-Mill-Tap Div'n, Romulus Tool & Engineering Co., Romulus, Mich., or — **Circle No. G24**

A New Line of Versatile Air Jigs is made in four types, each having many sizes. Two types are made to clamp downward (Model SF shown) by lowering the top plate, which is



raised or lowered by the plunger movement; the other two clamp the part upward to the stationary top plate. The Cleveland Universal Jig Co., 13404 St. Clair Ave., Cleveland 10, or — **Circle No. G25**

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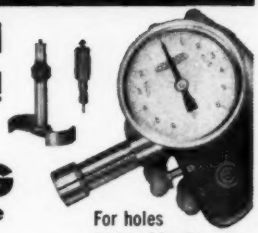

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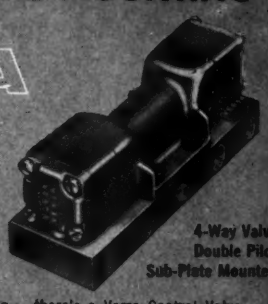

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Used in all industries . . . everywhere

This catalog shows the most complete line of work holding tools available anywhere for production on milling machines and drill presses . . . angle vises . . . drill press vises . . . swivel machine vises . . . adjustable angle plates with or without swivel bases . . . production vises . . . heavy duty angle vises . . . rotary and indexing tables for use on milling machines and drill presses . . . milling attachments for milling on lathes.

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125

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Fine Wood Drafting Furniture

Mayline wood tables have solid basswood tops. Ends are protected by steel cleats. Base is all oak beautifully finished. Tables available in six sizes and several combinations. Have comfortable platform type footrest.

Wood plan files are constructed entirely of Oak. Made in two sizes, for filing papers 24" x 36" and 30" x 42". Drawers slide easily and smoothly on lubricated runs.

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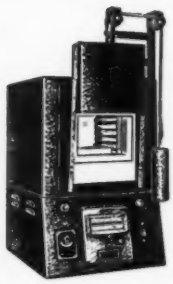

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- Multi-insulation
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- Shipped ready to operate

Request literature on complete line of Huppert furnaces and ovens.

Model No.	Inside Dimensions			KW	Prices 220 Volt Single Phase	
	Wide	High	Deep		With Huppert Input Controller	With Electronic Temp. Controller
869	8"	6"	9"	4	$296.00	$480.00
11*	8"	6"	12"	4	306.00	518.00
12*	8"	8"	12"	6	382.00	590.00
12A*	8"	8"	18"	9	490.00	698.00

*For 2300° F. add $95.00 to No. 11 and No. 12, and $105.00 to No. 12A. No. 12A can be furnished for 3 phase at no additional cost. For floor model add $52.00 to above prices. No. 869 standardly supplied for 2200°F.

K. H. HUPPERT CO.
Manufacturers of Electric Furnaces and Ovens

6820 Cottage Grove Ave., Chicago 37, Illinois

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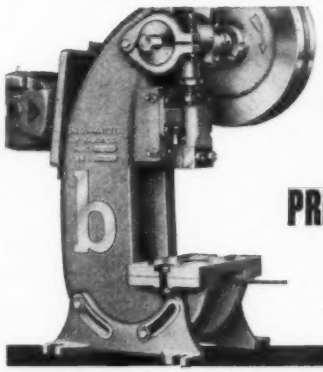

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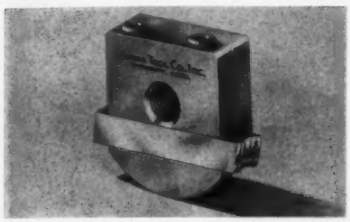
CIRCLE INFORM-A-GRAM KEY NO. 1104

New Floor-Type Horizontal Boring, drilling, and milling machines, with 4" and 5" spindles, are described in a 12-page catalog. Full pendant control, optional column heights, Tele-Vernier measuring system, and auxiliary work-holding units are discussed. Catalog 558 is available from The Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, or — **Circle Inform-A-Gram No. G26**

The Effect of Lubricants on the "wear in" of new machinery is the subject of the "Lubrications Newsletter 5," available from The Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn. Diagrams and charts show the results of tests made on the lubrication of mating surfaces. Request your copy from the company, or — **Circle No. G27**

Fast Setups for short runs can be accomplished with the Somma Kwik-Form tool bit holder. It screws right onto the toolpost like a form tool and fits front or rear slides for



forward or reverse motion. With Kwik-Form you don't have to remove the circular form tool post when using tool bits on short runs. Somma Tool Co., 109 Scott Rd., Waterbury, Conn., or — **Circle No. G28**

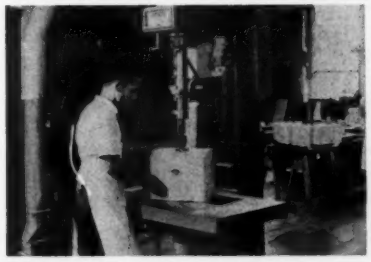
New Miniature Solid Carbide Drills, reamers, and end mills, in sizes as small as 0.024" dia, are featured in a catalog. Diameters, lengths, and applications in various materials are given. Super Tool Co. 21650 Hoover Rd., Detroit 13, will answer requests for Catalog SB-302, or — **Circle Inform-A-Gram No. G29**

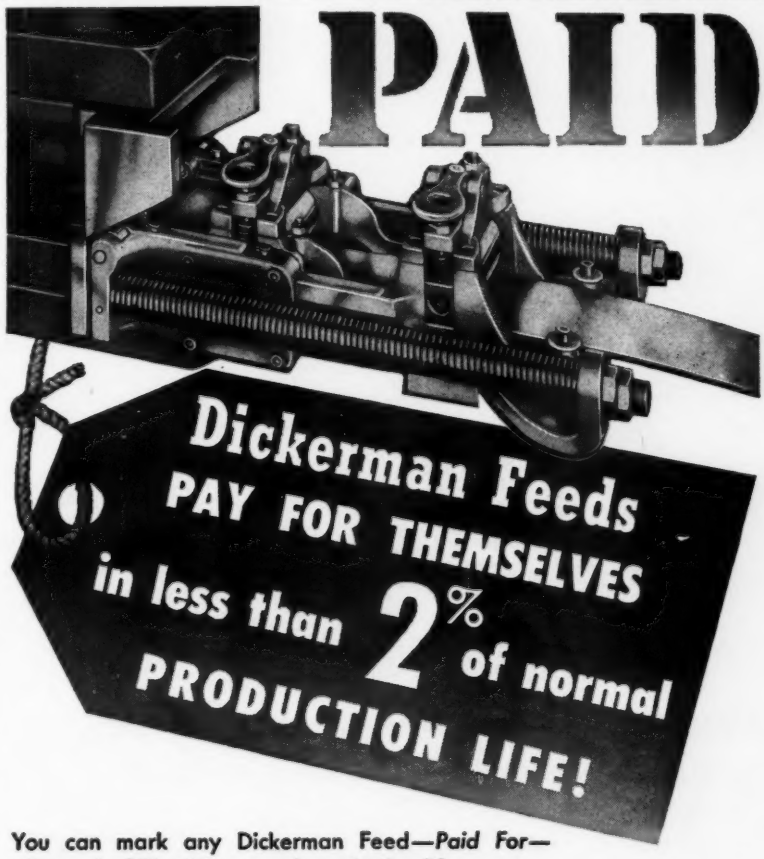
How to Reduce the Cost of drilling small holes and perform other machining operations on the new Burgmaster turret drill is explained in a bulletin. Specifications and operational techniques are included. Get the bulletin from Burgmaster Corp., 13226 S. Figueroa St., Gardena, Calif., or — **Circle No. G30**

The New Hartford Special 24" Super Spacer Indexing Unit is outlined in a bulletin which gives dimensions for different models and also lists accessories which can be used with it. Hartford Special Machinery Co., Homestead Ave., Hartford, Conn., supplies copies of this bulletin, or — **Circle No. G31**

"Miniature Threads and Tools," a new catalog, contains dimensions, tables, and other data on miniature threads (56 and 160 per inch). It also has prices for stock dies, taps, screws, and tools. Write to J. I. Morris Co., Southbridge, Mass., for Catalog 98, or — **Circle No. G32**

An Extra-Large Plain-Surfaced Tilt-Top Table, heavy-duty spindle and quill, and wide speed range are advantages of this versatile new precision drilling machine. Ideal for the pattern or model shop, the machine's table tilts to 45° either side, and can be run at 150 to 3600 rpm speeds. Leland-Gifford Co., Worcester 1, Mass., or — **Circle No. G33**





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Yes, only 1¾¢ per 1000 pieces for the first 2,000,000 run pays for a 3" Die-Feed . . . Then, you get up to 98,000,000 trouble-free pieces at no cost.

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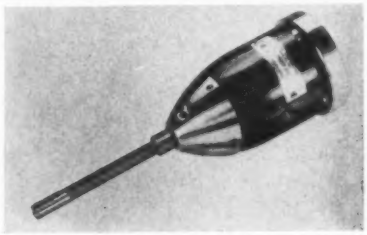
CIRCLE INFORM-A-GRAM KEY NO. 111

Machining

PRODUCTS & PROCESSES & PRODUCTS

This Fluid Transfer Gland Drilling Attachment for gun drilling has high speed ball bearings and magnetic seals which permit operations



to 15,000 rpm and 1500 psi. The removable housing on the flange attached model permits the gun drill to be permanently attached to the machine while the attachment is removed for maintenance. DuCas Corp., 1117 Douglas Ave., Providence, or — **Circle No. G34**

A New Line of High Precision Drill Jig Bushings is being offered in a catalog by Standard Bushing Manufacturers, Inc., 1501 Elmwood Ave., Providence 7, R. I. The bushings are listed in chart form with complete specifications. For Catalog 582, write the company, or — **G35**

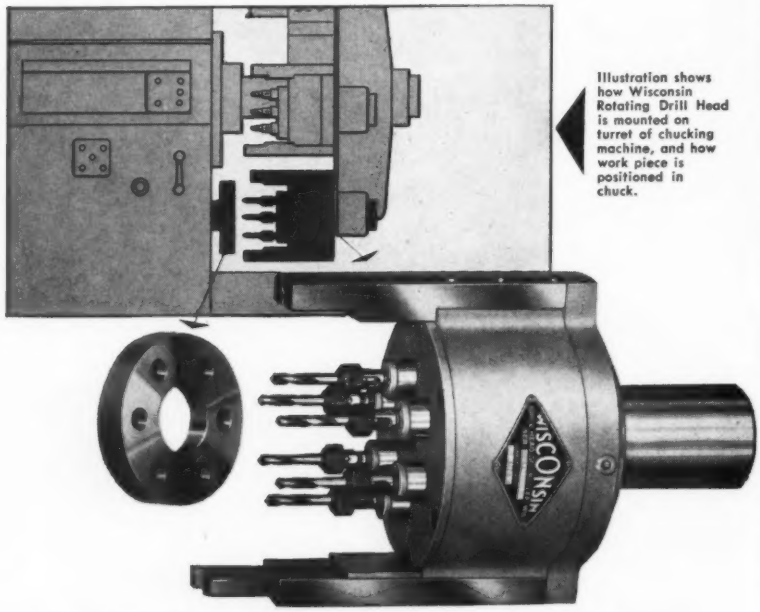


Illustration shows how Wisconsin Rotating Drill Head is mounted on turret of chucking machine, and how work piece is positioned in chuck.

WISCONSIN Rotating Heads for your Automatic Chucking Machines

Rotating Drill Heads and Tapping Heads by Wisconsin are winning wide favor because of their efficient performance on popular makes of automatic chucking machines and lathes. If you have a drilling or tapping operation to perform at low cost, consider the application of one or more of these heads specially engineered to your specifications. The Wisconsin engineering staff is qualified by training and experience to assist you in tooling for high speed, low-cost production. Send your "specs" and prints for quotation.

CONSULT OUR FIELD ENGINEERS OR WRITE —

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4975 NORTH 124TH STREET • BUTLER, WISCONSIN

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CIRCLE INFORM-A-GRAM KEY NO. 112

Tungsten Carbide Tips, tools, and inserts are under a new pricing system, described in a new catalog from Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30. The 55-page catalog also points out typical applications of some of the tools and gives specifications for those mentioned. Get Catalog TT1-58 from the company, or — **Circle Inform-A-Gram No. G36**

Super Finishing of Magnesium and Aluminum by milling can now be done with the new micro-finish milling cutters introduced by The O. K. Tool Co., Inc., Milford, N. H. Microcut cutters mill to 0.0001", hold

a 30 micro-inch finish, and eliminate many grinding and hand-finishing operations on aircraft and missile parts. For details, write the company, or — **Circle No. G37**

Interchangeability of Spindle Heads and Tables is one of the features of the Baker hydraulic drilling and tapping machine, offered in a catalog. Other design features, in addition to model specifications, floor plans, and dimensions are given. For Catalog 615, write Baker Brothers, Inc., 1000 Post St., Toledo, Ohio, or — **Circle Inform-A-Gram No. G38**

Specialty High Speed Steel and carbide cutting tools are outlined in a catalog, which gives information on combination drill countersinks, stop countersinks, rivet shavers, and back spotfacers. Also described are ID and OD military specification port contour cutters. Craig Tools, Inc., 133 Lomita St., El Segundo, Calif., supplies copies, or — **G39**

An Automatic Numerical Machine Tool Control System is completely discussed in a bulletin which outlines features, specifications, and optional equipment. Also given are several on-the-job applications of the tape control system. Get your copy from Autonetics Div'n, North American Aviation Co., Downey, Calif., or — **Circle No. G40**

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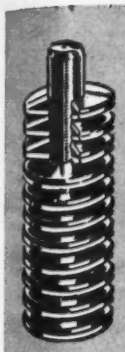

For reduction in noise and play in ball bearings, consider SCHNORR Disc Springs "K" (not shown).

Why SCHNORR Disc Springs Outlast Others . . .

Creeping, initial settling and gradual fatigue are eliminated when you use SCHNORR Disc Springs. Under normal loads, they provide **unlimited life!** SCHNORR Disc Springs offer other advantages:

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  Spring pressure, length and deflection are easily altered for the same size by lengthening, shortening or multiple stacking the spring columns.
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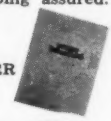
- **Great shock absorption,** minimal after-oscillation. A large degree of inherent and impact damping assured.

Most sizes available from stock.



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- WIDE RANGE OF STANDARD SIZES

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BY A QUICK, EASY, INEXPENSIVE METHOD
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WATTS BROS. TOOL WORKS
Wilmerding, Penna.

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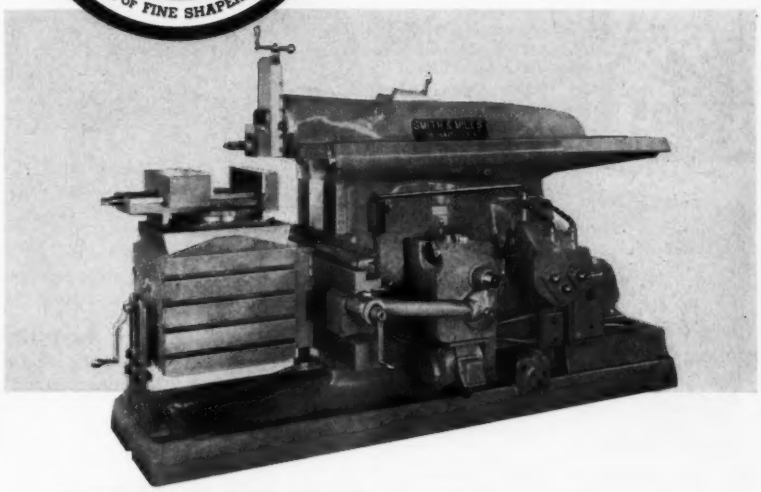
EXCLUSIVE SOLID TYPE RAM

Superior strength and simplicity of adjustment through patented backlash eliminator and self-locking ram screw preventing ram from changing positions under the heaviest cut. Makes this the most outstanding shaper ram design.



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Exclusive bull gear and rocker arm design . . . helio-centric rotation to universal table. Write for descriptive bulletin.

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DYKEM STEEL BLUE
Stops Losses
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With DYKEM Steel Blue
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Since 1907
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CUTS TIME AND COSTS WITH ONE-MOTION REEL LOADING

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Lifts and turns in one motion.

WRITE FOR COMPLETE DATA—New bulletins illustrate standard models and show how to handle all coil sizes safely, rapidly, without damage. Write for them today.

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Pneumatic & Hydraulics

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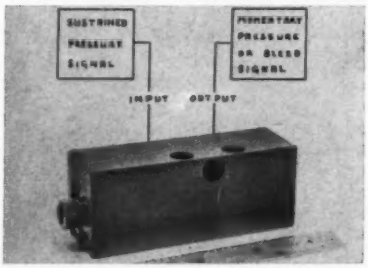
This Momentary Converter Valve provides an adjustable short duration pressure or bleed output signal from a sustained pressure input signal. The Hause V125A can be used



on machine tools or feeding devices to operate balanced-type 3- or 4-way valves. Hause Machines, Inc., Monpelier, Ohio, or — **Circle H1**

A Manually-Operated 4-Way Valve with built-in speed control is designed to afford precise operating speed regulation of double-acting cylinders and similar devices, in either or both directions. The large area control orifices assure unrestricted flow even when fully open for precise adjustment of speed. Valvair Corp., 454 Morgan Ave., Akron 11, Ohio, or — **H2**

Remove All Traces of Oil and micronic contamination from compressed air systems with the Super-Kleen air filter. It uses Micro-Pak disposable textile cartridges and handles volumes of air as high as 150 cfm at 100 psi with minimum pressure drop. Wilkerson Corp., 1640 W. Girard Ave., Englewood, Colo., or — **Circle Inform-A-Gram No. H3**

A New Shear Key Cylinder Mounting innovation has been adopted for surface-mounted square-type cylinders made by Hannifin. This

allows quick, positive alignment of the cylinder in a keyway milled into the mounting surface. Hannifin Co., Dept. 164, Des Plaines, Ill., or — **H4**

Heavy-Duty Hydraulic Cylinders are featured in a bulletin from Lindberg Air & Hydraulic Div'n, Teer, Wickwire & Co., 1936 Wildwood Ave., Jackson, Mich. Dimensional diagrams and a chart of specifications are included for this "H" line. Bulletin H-101 is supplied by the company, or — **Circle No. H5**

The Circuitpak, a low cost hydraulic power unit, contains an electric motor, hydraulic pump, valves, and oil reservoir and is manifold-circuited for direct connection to cylinder lines. It has a 2-gal-reservoir-capacity and 3600 rpm operational speeds with pressures up to 100 psi. Brown & Sharpe Mfg. Co., Hydraulics Div'n, Providence, or — **Circle No. H6**

Relieve Excess Pressures caused by thermal expansion of fluids in a closed system with the new leak-proof miniature valve described in a new bulletin. Detailed information and specifications are given for this small lightweight valve. Contact Fluid Regulators Corp., 313 Gillette St., Painesville, Ohio, for a copy of the bulletin, or — **Circle No. H7**

Reduction of Component Wear and elimination of anti-friction lubricants are possible with the new Atlas Compco twin air rotary-screw compressors because their rotors

don't quite contact each other during high-speed operation. They're available in 6,700, 10,000, and 19,250 CFM. models from Atlas Compco, 610 Industrial Ave., Paramus, N. J., or — **Circle Inform-A-Gram No. H8**

A New Combination Oil Reservoir and pet-cock unit that simplifies the filling and bleeding of its air-oil tandem cylinders, has been announced by Miller Fluid Power Div'n, Flick-Reedy Corp., 2040 N. Hawthorne Ave., Melrose Park, Ill. The small reservoir allows direct pouring of oil through it. For details, write the company, or — **Circle No. H9**

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- A New Type Hole Relation Gage.
- The finest Hole Relation Gage available.
- It's an instrument of the highest precision.
- Read the indicator directly, without turning either your hand, or the gage handle.
- The knurled thumb-knob rotates the extension spindle.
- As the outer shaft of the pilot remains stationary, wear is greatly reduced.
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- CON-CHEK is available in a full range of models, made up of stock components.

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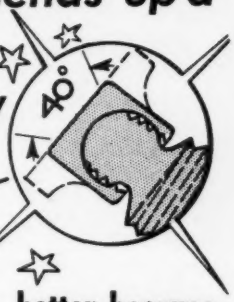

Threaded ball permits easy removal of swivel foot — for interchangeability — for assembly. SWIVEL ANGLE IS 40°, assures positive force with socket drive.

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VERSATILITY PLUS — Foot can be welded to fixture without danger to temper of ball!! HEAT TREATED AND RUST PROOFED

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Fluid-Feed ROTARY TABLE

Feeds parts fast! Combines with other stock units for easy, cost-cutting automation.

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PATHFINDER IN AIR POWER AUTOMATION

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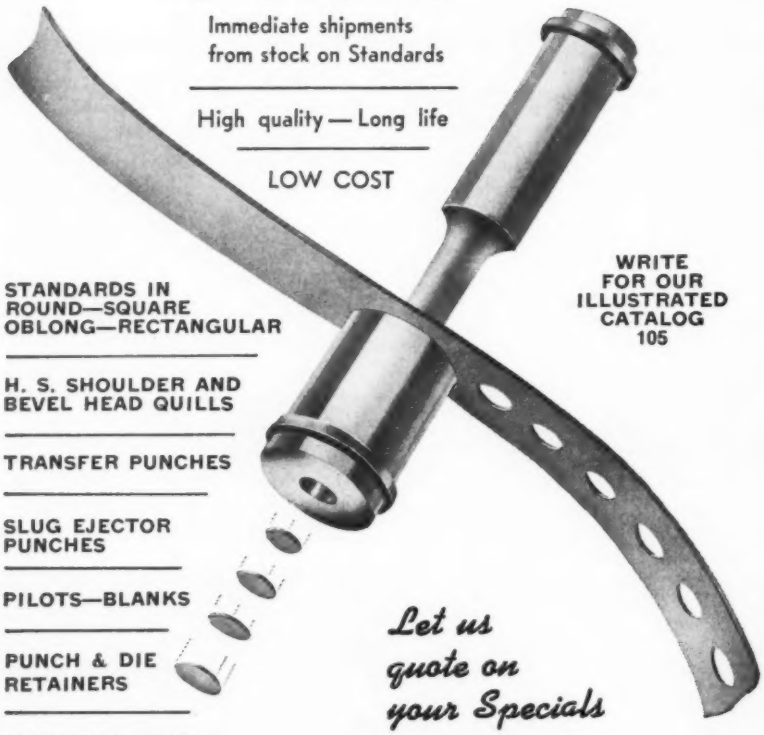
for your perforating problems

Complete interchangeability

Immediate shipments from stock on Standards

High quality — Long life

LOW COST



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H. S. SHOULDER AND BEVEL HEAD QUILLS

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WILLIAM T. HUTCHINSON CO.
53 Brown Ave., Springfield N. J.

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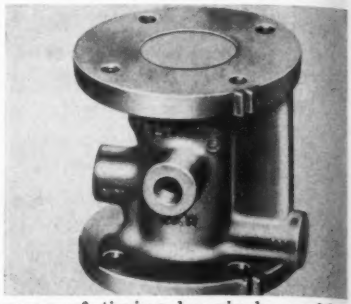
PRODUCTS & PROCESSES & PRODUCTS

A New Air Valve Development, which extends the time delay of standard sequence heads, is now available from Ross Operating Valve Co., 120 E. Golden Gate, Detroit 3. The "P" adaptor expands the



scope of timing by air by making available accurate time delays of up to 1 min. Get details from the company, or — **Circle No. H10**

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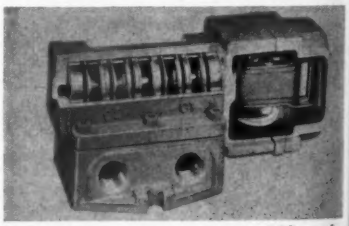

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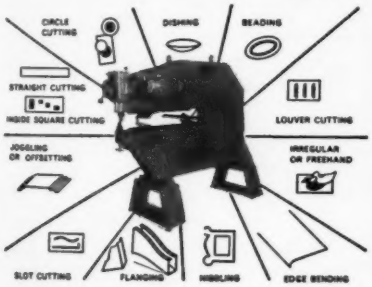

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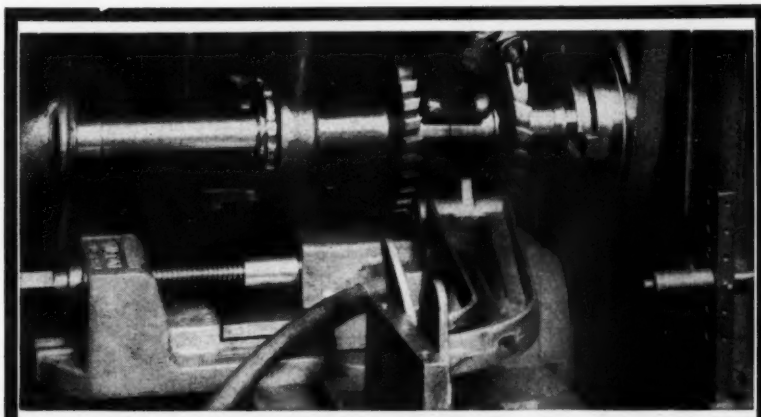

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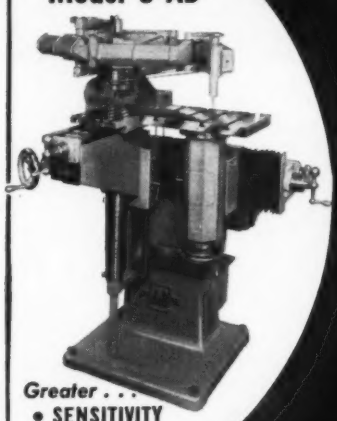

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Floating holders insure precision on reaming and tapping operations

Scully-Jones design means fewer rejects, less tool breakage, even on high-volume jobs

Misalignment between spindle and workpiece can seriously affect quality, cutting tool life, production rate, and maintenance costs. Yet, if you attempt to compensate for misalignment by using "wobble-type" floating holders, you can encounter any number of problems that defeat your purpose.

Binding or "dead" spots in the floating elements of certain holders can cause bell-mouthed, or out-of-round holes—oversized or tapered threads. "Cramping" can break fine cutting edges, reduce tool life, and hold up production.

In many floating holders, normal wear seriously affects efficiency and accuracy. That's why it is especially important when tooling up multiple-spindle machines to select a floating holder that guards against misalignment caused by index error, normal wear, manufacturing tolerances, and expansion or contraction of machines and fixtures due to temperature variations.

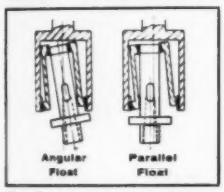

Fig. 1—Intermediate member of Scully-Jones floating holder uses the proved double-gear spline drive coupling.

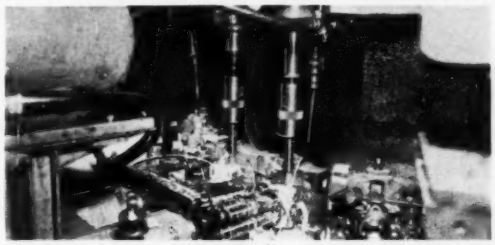

Fig. 2—Scully-Jones "JA" floating holders permit drilling and tapping operations to be performed at high speeds with outstanding accuracy.

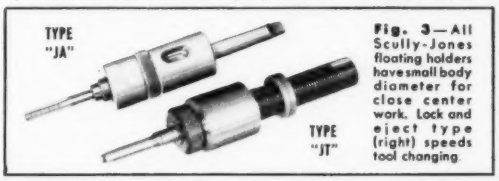

Fig. 3—All Scully-Jones floating holders have small body diameter for close center work. Lock and eject type (right) speeds tool changing.

Guide for selecting floating holders

Scully-Jones floating holders solve the foregoing problems by meeting the following specifications:

1. Balanced, constant velocity, flexible drive coupling
2. Freedom of lateral or angular movement
3. Uniform force requirement for moving in all directions
4. Efficient operation after normal wear
5. Minimum efficiency reduction from normal shocks and overloads
6. Sufficient and efficient seals
7. Provision for centering pin

By far the most important specification—for it gives you an efficient neutralizing component between the driving and driven members—is the Scully-Jones *double-gear spline drive coupling*. No other floating holder has it—every Scully-Jones floating holder does!

This feature permits utilizing proper clearance in the spline for required movement of the tool and allows equal freedom of float in all directions (Fig. 1). There are no binding or "dead" spots to limit effectiveness. You get consistent, high-quality performance on every hole you tap or ream.

Write to: Scully-Jones & Company, 1913 South Rockwell St., Chicago 8, Illinois.

SCULLY JONES PRECISION HOLDING TOOLS

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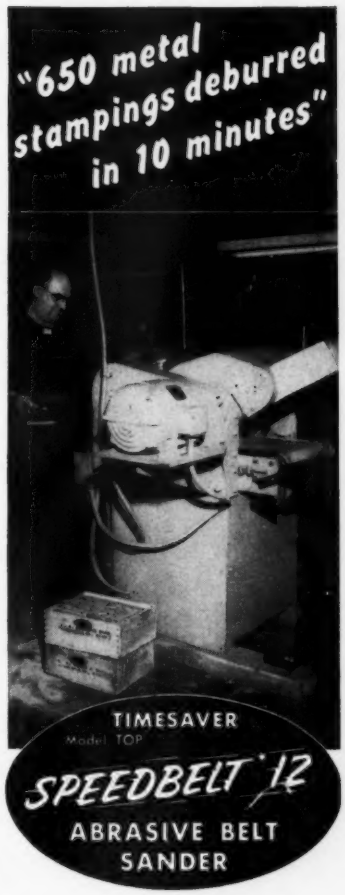
CONTINUOUS COOLANT CLEANER CUTS COSTS

By cleaning grinding machine coolants in a portable centrifugal clarifier, the Hartford Screw Co. saves over $200 worth of coolant each month. Use of the clarifier, a 14 gpm unit made by The De Laval Separator Co., also eliminates frequent draining and filling of coolant sumps.

Used with a number of centerless and cylindrical grinding machines that finish aluminum spindles for textile mills, the clarifier is connected into the coolant return line. It operates continuously.

With the clarifier, coolant need not be changed until it breaks down chemically. The unit is cleaned by emptying the 3-gal capacity dirt bowl. The portable clarifier can be shifted from one machine to another, or several machines can be connected to it at one time if the total amount of coolant used does not exceed 14 gpm.



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CUMULATIVE EDITORIAL INDEX FOR 1958 ISSUES

TOOLING & PRODUCTION Magazine

The number of subjects in which T&P's editors present material in just a few issues adds up very rapidly. Most articles are of lasting interest and have future reference value in solving tooling and production problems.

This cumulative index will build up progressively during each calendar year. Each issue will carry a cumulative index of material contained in all previous issues of the same year, with each January issue carrying the complete index of the twelve issues of the previous year.

We suggest you see to it that your copies of T&P are retained for future reference so you can get the full benefit of this new, unique and useful index.

The Publisher

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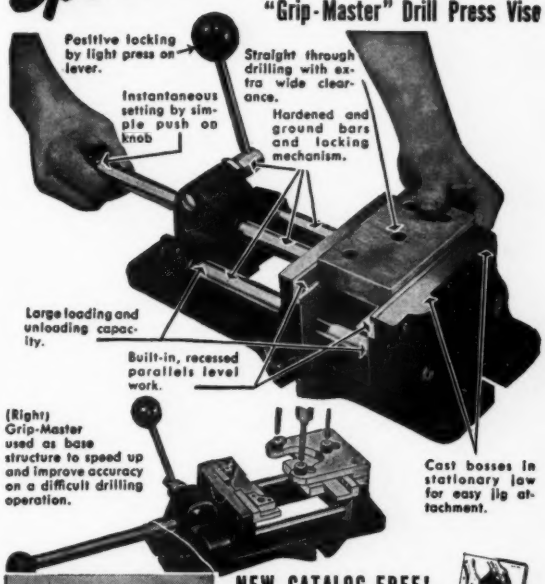
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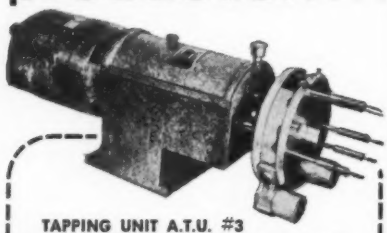

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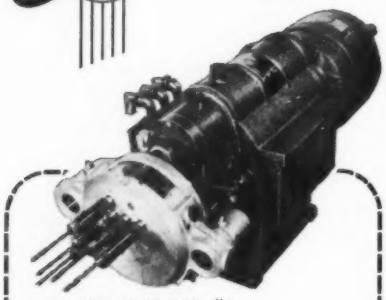

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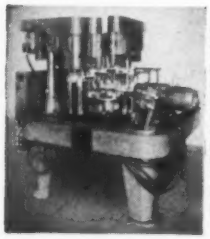

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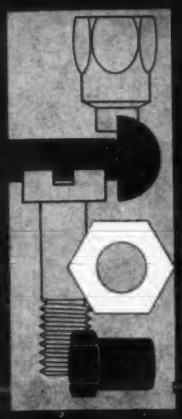

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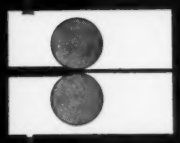

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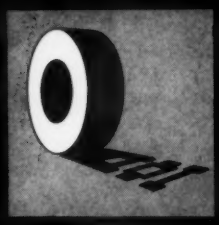

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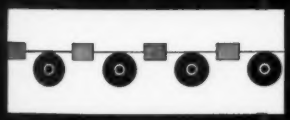

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